DOCUMENTS
IN AMERICAN
TELECOMMUNICATIONS
POLICY

DOCUMENTS IN AMERICAN TELECOMMUNICATIONS POLICY

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INTRODUCTION

To document communications policy in the United States one should go back to the beginning, to Article I, Section 8 of the Constitution: "The Congress shall have power...to establish post-offices and post-roads" (subsection 7), "to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries" (subsection 8), and "to regulate commerce with foreign nations, and among the several states..." (subsection 3).

In these few words rests the foundations of current American telecommunication (electrical communication over a distance) policy. The federal government has the clear authority both to foster and to regulate interstate communications, and has exercised it for nearly 200 years. However, even before the ratification of the Constitution in 1789, there was a long development of these principles. In the Western hemisphere alone, there are such varied examples as the construction of foot roads for royal Incan messenger-runners along the flanks of the Andes and the establishment of a system of post roads in the North American colonies by the British Crown (Benjamin Franklin headed this system for a time). In the Old World, the story stretches back to Roman road and semaphore systems and the signal fires that announced the fall of Troy – and before. Transportation was communication until less than a century and a half ago. Rudyard Kipling once went so far as to say "transportation is civilization." As post roads, merchant shipping, and other modes of transport became speedier and more reliable, so did communication. Railroads, steam powered vessels, complex mechanical semaphore systems, and even carrier pigeons were only more efficient ways of transmitting messages within the limits set by human (and animal) abilities to travel and perceive.

Although the link between transportation and communication remains – analogies can be drawn between the building of roads by the Incas and Romans, the mutual interdependence of the railroads and the telegraph in this country in the 1800s, and the current proposals by "wired nation" advocates for using broadband communications as a transportation (and energy) saving technique – there also remains the need for a political directing force to both foster and regulate this glue that holds the nation together.

The administration of nations and the economies of continents requires at least partial answers to four primary questions or criteria for evaluating any message-carrying system: how far? how fast? how many? how much? The tradeoffs were (and still are) many – speed could be obtained at the sacrifice of quantity, distance at the sacrifice of speed, and so on. Technology, in the form of the printing press, came close to solving the problem of producing multiple copies ("how many?") in the Western world nearly 500 years ago, but at the cost of centralization – a problem now nearly transcended with growth of the availability of xerography and offset printing in the last two decades. The second question answered was "how fast?" when, in the 1840s and later, the first practical electrical telegraphs transmitted a few words a minute hundreds of miles in a matter of seconds – another tradeoff of speed for quantity. (The Pony Express, the fastest transcontinental system of its time, lasted only 16 months – ceasing operations as soon as the coast-to-coast telegraph line was a reality). Further technological and operational developments including the telephone, which removed the need to learn a special code and was two-way in operation increased the amount ("how much?") of information transmitted, and radio's advent three-quarters of a century ago eliminated distance ("how far?") as a major factor.

Each of these developments affected government, perhaps crucially. The printing press, by allowing a secular and later a merchantile system for the copying and dissemination of information and knowledge weakened the power of both church and state – at the same time improving the internal efficiency of both institutions to the point where they couldn't afford to be without printing. Rulers spent much of their treasure insuring that military and other intelligence reached the seats of government rapidly...whether by relay of runners or men on horseback, by semaphore (particularly in France) or by the later electrical telegraph. The conduct of war – perhaps the most important function of government – was changed forever when field commanders became tied to higher civil or military authority by means of the telegraph at the time of the Civil War. The economy, down to the distribution of essential foodstuffs, depends upon communication – and no government can afford the risk of leaving the national communication system entirely without supervision.

The genius of the American system of government is that our laws, unlike those in many lands, essentially are proscriptive rather than prescriptive. Under this system, a few things that one may not do are prohibited; anything not so listed is permitted. (Under the prescriptive system, those things that one may do are listed; all else is forbidden). When combined with the responsibility of Congress to "promote the progress of science," this tends to lead to providinq seed money without strings, or to a deliberate attempt to reduce or eliminate governmental ownership as soon as possible, (as with the telegraph and the space communications satellite), and to rely upon the marketplace for much of the public's protection against inadequate service and economic despotism.

The system in the United States today reflects these principles. At several points – such as when Congress appropriated monies to build Morse's first telegraph line, when the government took over most radio and wire communication facilities during World War I, and when control over space communications satellites was debated early in the 1960s – it could have been otherwise. All or part of our electrical communications could have become part of a system operated directly by a governmental agency. Many countries adopted this approach although, as former Federal Communications Commissioner Lee Loevinger pointed out, "There are government owned and operated...systems, systems owned by government and operated privately and autonomously, and private systems operated under strict government control. The difficulty is that there is almost every conceiveable variation and mixture of these patterns, and each country has its own combination of varients." (Lee Loevinger, "The Lexonomics of Telecommunications," Journal of Broadcasting, 11:4:285-311 at 286). The United States system, with some exceptions, is privately owned and under relatively loose governmental control, particularly loose in the case of content. In recent years we have even dismantled the Alaskan communications system formerly run by the military, and have turned the Post Office Department into the one-step-removed-from-direct-control U. S. Postal Service. On the other hand, to illustrate the continuing tradition of fostering new developments, federal monies are a mainstay of the Corporation for Public Broadcasting.

Loevinger (pp. 294-296) points out that there are five major problems faced by all telecommunications systems, regardless of the form of legal or economic organization. These are: the establishment of technical standards and specifications, making instruments available, financial support, programming (particularly in the case of broadcasting) and government control. His analysis (which includes examination of the legislation, intervention, regulation and operation of a telecommunication system vis-a-vis government) can be applied to the United States – which has exhibited a remarkably consistent policy in the nearly 140 years since the telegraph was invented.

In this country, because of our proscriptive legal system, the public interest has been defined by default; the government rarely has set service standards; and has allowed the private interests of entrepreneurs and technological innovators to dominate development of new telecommunication devices or industries. In this climate, although the telegraph was given tremendous impetus by what were in effect government grants (and by prompt arrival on the scene of the Civil War and the railroads), it was allowed to wither on the vine after successful innovation of the telephone. Today the Bell Telephone System is the most efficient and largest civilian telecommunication system in the world, but public message telegraph service (excluding perhaps Mailgrams) is priced out of the market. In other countries, however, public policy and poor telephone service preserved the telegram. Readers of the Sherlock Holmes stories will recall that the famous fictional detective used the telegraph a score of times for every time he used the telephone during the decades leading up to World War I.

Yet, although later supplanted by the telephone, it was the successful invention and innovation of the telegraph by Samuel F. B. Morse that marked the start of American telecommunications and telecommunications policy. The telegraph reigned supreme for more than half a century, and has survived for more than a century. The first document dealing with "the propriety of establishing a system of telegraphs for the United States" was a House of Representatives resolution on February 3, 1837 calling upon

Secretary of the Treasury Levi Woodbury to report on this matter. He did so on December 6, 1837, enclosing a copy of his March 10, 1837 circular asking various persons to give him their opinions on the concept of the electrical telegraph. One of these persons was Morse, who provided both the results of his experimentation and a complete prospectus. On April 6, 1838, the Committee on Commerce presented House Report 753, 25 Cong., 2nd Sess., which recommended that Congress appropriate $30,000 for construction of the demonstration line proposed by Morse. H. Rep 753,titled,Electro-magnetic Telegraphs, incorporates parts of H. Doc. 15, 25th Cong., 2nd Sess. (Dec. 11, 1837; essentially the report from the Secretary of the Treasury mentioned above). This document and the report on Magnetic Telegraph from Baltimore to New York (H. Rep. 187, 28th Cong., 2nd Sess., March 3, 1845) are published in Alfred Vail's The American Electro Magnetic Telegraph: With the Reports of Congress, and a Description of All Telegraphs Known, Employing Electricity or Galvinism (Philadelphia: Lea & Blanchard, 1845) which was reprinted by Arno Press in 1974 under the title Eyewitness to Early American Telegraphy in Arno's series on Telecommunications, and consequently isn't reprinted in this volume.

In the 1845 Magnetic Telegraph from Baltimore to New York report one finds – for the first but not the last time – an enthusiastic proposal for government control of electrical communication, based on the "post-office and post-road" authority given Congress in Article I, Section 8. Even Morse, in a December 12, 1844 letter to then-Secretary of the Treasury G. M. Bibb (also reprinted in Eyewitness to Early American Telegraphy), commented that "For myself, I should prefer that the government would possess the invention, although the pecuniary interests of the proprietors induce them to lean toward arrangements with private companies." But this push toward government ownership, supported strongly by Cave Johnson, the Postmaster General of the time (and nominal supervisor of Morse's operation of the first line; (see H. Exec. Doc. 2, 29th Cong., 1st Sess., Dec. 1, 1845, pp. 860-861), did not strike a responsive chord in Congress. The "proprietors" won out, and soon the telegraph became a commercial and indispensible adjunct to the railroads. The telegraph provided the ability to schedule traffic, the railroad provided rights of way between centers of population (prospective customers) and both shared the costs of the operator. After the Interstate Commerce Commission was established in 1887, it was given limited authority over both interstate transportation and interstate telegraphic communication.

Nearly 60 years later, a new technology required a new policy. For more than half a century, except in wartime or isolated regions, commercial telegraph companies provided both public and governmental wire message transmission service. By 1904, wireless (radio) telegraphy had been successfully invented and innovated, and a number of conflicts had developed. One was the competition between different systems, such as those of Marconi and de Forest; another was the desire of government agencies (particularly the Navy) to have control over their own message transmissions, a desire opposed by commercial companies – some of which, such as American Marconi, were owned or controlled by foreign firms; and yet another was the internecine skirmishing between governmental users such as the Navy, the Army, and the Agriculture (which used radio for acquiring weather forecast meterological data) Departments.

In mid-1904, President Theodore Roosevelt appointed an Interdepartmental Board of Wireless Telegraphy (the "Roosevelt Board") to study the "entire question of wireless telegraphy in the service of the national government." Weighted heavily with Navy officers (the representative of the Dept. of Commerce and Labor, for instance, was chairman of the U. S. Lighthouse Board and a Navy rear admiral), the Roosevelt Board recommended that the Navy assume responsibility for all government radio except that required by the Army (which wasn't to interfere with Navy coastal stations), and that many circuits either operated or desired by commercial companies be taken over by the Navy. Those private coastal stations that remained, and private wireless telegraph stations in the interior of the country, should be supervised by the Department of Commerce and Labor, partly to "prevent the control of wireless telegraphy by monopolies or trusts." This report, according to Navy historian L. S. Howeth (History of Communications-Electronics in the United States Navy, Washington: Government Printing Office, 1963, p. 77n) "formed the Government's policy in the use of radio for almost two decades." The report of the Roosevelt Board, Wireless Telegraphy: Report of the Inter-Departmental Board Appointed by the President to Consider the Entire Question of Wireless Telegraphy in the Service of the National Government (Washington: Government Printing Office, 1904) is the first item published in this volume of Documents in American Telecommunications Policy.

In the period immediately after the introduction of the wireless telegraph in the United States there was no legislation adequately covering the field. The 1903 and 1906 Berlin international conferences on wireless telegraphy didn't lead to approved legislation (although there were bills that failed) until the Wireless Ship Act of 1910. This Act, the Wireless Ship Act of 1912, the Radio Act of 1912, and the protocols resulting from the Berlin conferences are readily available, and need not be reprinted in this volume. (The Government Printing Office has published a number of editions of Radio Laws of the United States, compiled by Elmer A. Lewis, Superintendent of the Document Room of the House of Representatives).

During World War I, virtually all radio stations (including amateur, coastal and transoceanic) were either closed down by governmental order or taken over by the Navy for its own use or for censorship control. The telephone and telegraph systems were taken over by the government and operated under Post Office supervision. Postmaster General Albert Burleson since long before we entered World War I had been a staunch advocate of the concept of telecommunications control adopted by most major nations: a "posts, telegraphs and telephones" (PTT) administration. His report to Congress in 1914 (Government Ownership of Electrical Means of Communication, Senate Doc. 399, 63rd Cong., 2nd Sess., 1914) is a landmark in the story of American telecommunications policy, even if rejected by Congress at the time. Burleson didn't give up, and he and Secretary of the Navy Josephus Daniels were among those who encouraged the Alexander bill to eliminate commercial interests from the ship to shore radio communications business by (among other things) purchasing their stations. This bill was considered several times during the period 1916-1919, but did not pass. Daniels and Burleson also were active in the successful attempt to block sale of the Alexanderson Alternator (then the most effective high-power transmitter for overseas communication) to British Marconi by General Electric at the end of World War I, which in turn led to the establishment of the Radio Corporation of America (RCA) and firm American control of its overseas communications. The primary document, Burleson's report, is excerpted in this volume of Documents in American Telecommunications Policy.

Following the adoption of the Wireless Ship Act of 1910 and the Radio Act of 1912, a certain amount of ministerial control of radio communication – inspection of shipboard stations, issuance of licenses, etc. – was exercised by the Secretary of Commerce and Labor (Secretary of Commerce after 1913) until the effective date of the Radio Act of 1927. In an earlier Arno Press series (History of Broadcasting: Radio to Television, 1971) the Annual Reports of the Federal Radio Commission from 1927 through 1933 and the Annual Reports of the Federal Communications Commission from 1934/1935 through 1955 were published in their entirety in four volumes. Now, in this series on Historical Studies in Telecommunications, we provide reports on the regulation of radio by the Department of Commerce from 1909 through 1932 – from the start of American radio regulation to the beginning of the previously published series of FRC/FCC Annual Reports. These new materials include excerpts dealing with radio from the Reports of the Secretary of Commerce and Labor (1909-1912, inclusive), Reports of the Secretary of Commerce (1913-1920, inclusive), Annual Reports of the Commissioner of Navigation to the Secretary of Commerce (1921-1926, inclusive) and Annual Reports of the Chief of the Radio Division to the Secretary of Commerce (1927-1932, inclusive).

During the latter part of this period – essentially after late-1920 – radio broadcasting became a public service of high visibility and political importance. There was considerable disagreement over the roles and practices of broadcasting, and Secretary of Commerce Herbert Hoover, who personally disapproved of the commercial use of radio broadcasting for advertising, called a series of National Radio Conferences to discuss the purposes, problems and future of the medium. The reports of the three most important of these conferences (Recommendations of the National Radio Committee, 1923; Recommendations for Regulation of Radio Adopted by the Third National Radio Conference Called by Herbert Hoover, Secretary of Commerce, Washington, D. C., October 6-10, 1924; Proceedings of the Fourth National Radio Conference and Recommendations for Regulation of Radio, Conference Called by Herbert Hoover, Secretary of Commerce, Washington, D. C., November 9-11, 1925) are reprinted in this volume.

These conferences, held at intervals from February 1922 to November 1925, provided the Secretary with input and support necessary to exercise control of radio with respect to frequency allocation and assignment, hours of operation, classification, and other policy matters. However both a court decision (U. S. v. Zenith Radio Corporation, 12 F. 2d 614 (N. D. Ill.) April 16, 1926) and an opinion of the U. S. Attorney General (35 Ops. Att'y Gen. 126, July 8, 1926) held that (in the words of the Federal District Court), "There is no express grant of power in the Act to the Secretary of Commerce to establish regulations." As a result, Secretary Hoover could do nothing to effectively regulate broadcasting so as to reduce or eliminate interference, and the implementation of recommendations of the National Radio Conferences was ended.

Most of the powers assumed and then lost by Secretary Hoover were incorporated into the powers of the first body established solely to regulate radio: the Federal Radio Commission. Originally given a year to clean up the regulatory chaos left by the 1925 decisions (it was thereafter to be an appellate body, with day-to-day operations returned to the Department of Commerce) the complexity of its task led to extentions of the FRC's operational authority, and eventually to the establishment of a permanent body, the Federal Communications Commission, as a result of passage of the Communications Act of 1934. To understand the FCC and its powers, it is helpful to examine the establishment and powers of the FRC. This is admirably done in Laurence F. Schmeckebier's The Federal Radio Commission, published as Service Monographs of the United States Government No. 65 of the Institute for Government Research of the Brookings Institution in 1932, and reprinted herein.

Much of the material in the second volume of Documents of American Telecommunications Policy deals with questions of the political economy of the electromagnetic spectrum. This is a continuing topic of concern, with proposals and policy statements issued every year, dealing with such concepts as cable television (CATV) and the "wired nation," the use of space communications satellites, pay-TV, and ownership of multiple outlets of mass communication. The competition for frequencies by various services (such as land mobile and UHF television) is vicious, and the stakes are enormous. Although many scholars and government offical presently are working in this field, little attention was paid to it until the 1950s. Before that time, radio and wire communications grew independently (although there was an FCC general policy that wire be used whenever possible in order to conserve radio spectrum space), and there always seemed to be additional reaches of the spectrum that could be used if the engineering talent available in the laboratories of the larger manufacturers (or the military, or amateurs) would only put their minds to the problem.

By 1951 this policy of haphazard growth had created many problems, not the least being the case of television assignment practices (spelled out by the FCC during the 1948-1952 "freeze" on new television station applications). An increasing conflict over priorities for radio communication facilities between governmental users (represented by the Interdepartment Radio Advisory Committee, established in 1922 and now part of the Office of Telecommunications Policy) and civilian users (represented by the Federal Communications Commission) led President Truman to appoint an advisory body, the President's Communications Policy Board. The report of this body, Telecommunications: A Program for Progress (Washington: Government Printing Office, 1951), analyzes both the immediate situation and the competing philosophies behind various suggestions for the future and is included in volume 2.

Another hard-to-find report in volume 2 of Documents in American Telecommunications Policy is a theoretical study by the Joint Technical Advisory Committee of the Institute of Radio Engineers and the Radio-Television Manufacturers Association which examines characteristics of different parts of the radio spectrum and proposes an "ideal" program for the conservation of spectrum resources in Radio Spectrum Conservation (New York: McGraw Hill, 1952). The final section in this volume is a reprint of Dallas Smythe's monograph on The Structure and Policy of Electronic Communication (Urbana: University of Illinois Bulletin, Vol. 54, 1957). Smythe, former Chief Economist for the FCC, was instrumental in the preparation of the FCC's "Blue Book" (Public Service Responsibility of Broadcast Licensees. (1946), reprinted in the Arno Telecommunications series), and has had – from a position behind the scenes – influence on the development of policy in several telecommunications fields, as well as on a generation of researchers and scholars through his teaching at various universities. His monograph is both an end to these two volumes of Documents in American Telecommunications Policy and an opportunity to begin study in the voluminous current literature of this field, including those works listed in the bibliography at the end of this introduction.

It would be difficult to overstate the importance of telecommunications policy. The very future of our nation depends upon the quality and quantity of political and economic information made available to its citizens or, from another angle, upon our military telecommunications system. Fortunes may be made or lost, political and other careers enhanced or diminished, and the quality of life for everyone may be modified by such futuristic telecommunications concepts as the "cashless society" or the "wired nation." Starting with the December 7, 1968 Final Report of President Johnson's Task Force on Communications Policy and continuing through a variety of recent public (notably from the Office of Telecommunications Policy in the Executive Office of the President) and private (the Rand Corporation, Sloan Foundation, etc.) proposals, we find a growing emphasis on "efficiency" in the management of the electromagnetic spectrum, and a growing faith in the potential of broadband wire communications as a replacement for such diverse institutions as transportation (commuting to work) and broadcasting. The FCC has had to shake off its traditional lethargy and work on the plans and ideas that grew from these reports. Congressmen are realizing that the fusion of complex technology, economics, politics, and nature's rules for electromagnetic radiation require more work and perhaps fewer headlines. Little inspection of the past is going on during this orgy of looking to the future – yet, as Francis Bacon said, "Crafty men condemn studies, simple men admire them, and wise men use them."

One of the maxims learned by every American schoolchild is "That government is best that governs least." This familiar dictum, even when modified by replacing the terminal "least" to "best," is really an unusual one when considered globally. As discussed earlier, examination of the legal structure of most countries shows that their systems are to a greater or lesser degree prescriptive. In the United States, on the other hand, our governmental structure is generally built on the proscriptive principle of a few "thou shalt nots" with everything else permitted. The only positive requirement in broadcasting law, for instance, is that stations operate in the public interest, convenience and/or necessity. This single prescriptive standard, of commendable vagueness, is then followed in the law by a number of negative proscriptions, which are intended to prohibit acts that may lead to denial of the rights of others. Such a system allows the broadcaster an opportunity to engage in the nearly infinite range of activities that are not specifically prohibited – a choice that is fortunate, unusual, and very precious. Even common carrier (telephone and telegraph) telecommunications regulation, which oversees rates as well as operating standards, essentially is proscriptive in nature.

We are so used to the workings of this existing system that we no longer ask how it came about, or whether the Constitutional injunction upon the Congress to "promote the progress of science and useful arts" doesn't override the clause dealing with the right of the government to regulate interstate commerce when faced with new technology. Our telecommunications policy wasn't written down or amended as was the United States Constitution by people thoroughly conscious of their task: it grew like Topsy. In light of the many changes in the fabric of American telecommunications policy over nearly two centuries, it is presumptuous to maintain that "our system of telecommunications" is monolithic, unchanging – or correct.

Some things are beyond the power of governments, and are equally beyond the power and capabilities of private enterprise: for example, circumventing the technological imperatives of the electromagnetic spectrum or satisfying all the desires, wants, needs and dislikes of each and every citizen. There are an infinite number of forms that a telecommunications system or policy can take – and to devise the "best" one of these for our own immediate or long-term future requires examination of what has gone before. This is the underlying reason for publishing Documents in American Telecommunications Policy.

John M. Kittross

February, 1976

A CHRONOLOGICAL LIST OF
SELECTED BOOKS ON AMERICAN TELECOMMUNICATIONS POLICY

(The following list deliberately omits unpublished theses and dissertations,the voluminous periodical literature of recent years, most Congressional hearings and reports (including those mentioned on the preceeding pages), and materials concentrating on international and foreign aspects of telecommunications policy (some of which can be found in the Arno Press series on Telecommunications (1974) and International Propaganda and Communications (1971). Readers also are directed to *Administration of American Telecommunications Policy*, a companion volume to this two-volume set of *Documents in American Telecommunications Policy*. The contents of the companion volume are printed on the last page of volume 2 of the *Documents* set.)

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❦

WASHINGTON
GOVERNMENT PRINTING OFFICE
1904

LETTERS OF TRANSMITTAL.

WHITE HOUSE,
Washington, July 29, 1904.

MY DEAR MR. SECRETARY: I am directed by the President to forward to you the accompanying report from the Inter-Departmental Board on Wireless Telegraphy, which he approves and directs that the several Departments concerned put its recommendations into effect. The Navy Department being that most in interest, this communication is made to it and it will please advise the other Departments of the action taken, sending them copies of the report.

Very truly, yours,

WM. LOEB, Jr.,
Secretary to the President.

Hon. PAUL MORTON,
Secretary of the Navy.

DEPARTMENT OF COMMERCE AND LABOR,
LIGHT-HOUSE BOARD,
Washington, July 12, 1904.

SIR: I have the honor to inclose for your consideration the unanimous report of the Board on Wireless Telegraphy convened by your order of June 24, 1904.

Very respectfully,

R. D. EVANS,
Rear-Admiral, U. S. Navy,
Chairman, Light-House Board.

The PRESIDENT.

A.

WHITE HOUSE,
Washington, June 24, 1904.

MY DEAR SIR: The President has appointed Rear-Admiral Robley D. Evans, Rear-Admiral Henry N. Manney, Brig. Gen. A. W. Greely, Lieut. Commander Joseph L. Jayne, and Prof. Willis L. Moore as a board to consider the entire question of wireless telegraphy in the service of the National Government, and submits for the consideration of the board the accompanying papers upon which he desires a report in full.

Very truly, yours,

WM. LOEB, Jr.,
Secretary to the President.

Rear-Admiral ROBLEY D. EVANS,
Chairman Light-House Board,
Department of Commerce and Labor.

LIGHT-HOUSE BOARD ROOM,
Washington, July 12, 1904.

The Board first met in the Light-House Board room, in obedience to the order of the President and pursuant to the call of the chairman, at 11 a. m., July 6, 1904. Present, all the members.

The chairman requested Lieutenant-Commander Jayne to act as recorder, and then read the letter appointing the Board, a copy of which is prefixed, marked "A," and the inclosures, marked "B" to "J," inclusive.

After the reading of the memorandum from the Secretary of Agriculture, marked "D," Professor Moore stated that Mr. Fessenden had, since it was written, made a satisfactory settlement of the claims against him by assigning the patent rights in question to the Department of Agriculture, Weather Bureau.

The Board thoroughly discussed and maturely considered the questions before it at its meetings held from time to time, all the members being present at each meeting.

The following was found to be the status regarding Government wireless telegraph stations:

(a) The Department of Commerce and Labor has established no stations, but permission has been granted to other departments to erect 10 on light-house reservations and on the Nantucket Shoal light-ship and its relief.

(b) The Army has operated 6 stations and is preparing to install 2 others in Alaska. The urgent necessity for the stations in Alaska has caused the temporary removal of the apparatus from 2 of the first mentioned, but it is in process of replacement. Four other Army stations have been proposed, but for 2 of these the Chief Signal Officer thinks that the proposed naval stations in the same localities, if available to the Army, would make duplication unnecessary. The Army also has 1 portable train for use in maneuvers or for other military purposes.

(c) The Department of Agriculture made valuable and extensive experimentation, and has established 2 stations and contemplated establishing others at prominent points along the coast lines.

(d) The Navy Department has established 20 shore stations. The apparatus has been removed from 1 of these but will be replaced in a few days. Arrangements are being made for the establishment of 10 more in the near future—a complete equipment, or some portion of it, having been ordered for each one. This includes the 2 lightships that take turns on Nantucket Shoals. In addition to these 30 stations it is proposed to establish about 50 more on shore and to start on the more important of these at an early date.

The Navy Department has entered into a very important contract for the equipment of long-distance stations at Key West, Guantanamo; points to be determined in Porto Rico and on the Panama Canal Zone, and Pensacola. Satisfactory communication is to be established between all of the first 4 and between Key West and Pensacola. Communication from any one of these stations to ships at any points between it and a communicating station is also to be established.

Twenty-four naval ships have already been equipped, and 10 others are to be equipped immediately, or before the completion of the repairs which they are undergoing. It is proposed to equip 68 others after the report of the Board which is now conducting tests of various systems has been acted upon, making a total of 102.

One torpedo-boat outfit has been ordered for trial. If this apparatus is successful a number of torpedo-boat destroyers and small gunboats may be equipped, making the total number considerably larger.

With these small vessels provided with wireless apparatus, there would be about 200 naval stations on shore and afloat.

(e) The Treasury Department, while having under consideration wireless installations for the Life-Saving Service and the Revenue-Marine Service, has established no stations, but has relied on a leased commercial wireless system.

The following was found to be the status of private stations:

The Marconi Company has a long-distance station on Cape Cod for communicating across the Atlantic, and 2 others of comparatively short range on Long Island. The Board understands that that company proposes to establish numerous stations along the Atlantic and Pacific coasts.

The New York Herald Company has a station on the light-house reservation on Sankaty Head, Nantucket Island, and has been permitted to maintain stations on the 2 light-ships which relieve each other on Nantucket Shoals. These privileges have been withdrawn, however, owing to the refusal of the Marconi Company, which operated them for the Herald, to receive wireless messages from vessels using other systems.

The American De Forest Wireless Telegraph Company and the National Electric Signal Company (Fessenden system), have stations in the vicinity of New York, and both propose to establish a chain of them along the coast. The former company has already begun operations at Cape Hatteras and at Key West, and has announced that they propose to establish several stations to bridge the Pacific and make foreign connections. It has also established several stations away from the sea coast, especially on the Great Lakes, and is planning to have a regular interior system, according to one of its officers.

The Fessenden system has stations in Philadelphia and Washington Fessenden states that his company is negotiating for permission to establish communication with Bermuda.

The Providence Journal maintains several stations in the vicinity of Narragansett Bay, and there are several other systems which are at present not very active.

On the Pacific coast the Pacific Wireless Telegraph Company has several stations, and has been making persistent efforts to obtain authority to establish stations on the light-house reservation, Farallon Islands, and at other prominent Government reservations along the Pacific coast.

There is an interisland system operated in Hawaii.

A number of trans-Atlantic liners are using the Marconi apparatus. Few coasting vessels are using any system, but the indications are that this method of communication will come into quite common use when the shipowners feel that conditions are favorable.

The Navy Department has at times been very seriously interfered with in the vicinity of New York and Boston, and there are already so many stations in the vicinity of Newport that an effort has been made by the officer in charge of the torpedo station to establish a tentative arrangement whereby the various stations will interfere as little as possible with each other.

Reports from the naval wireless station on Cape Cod indicate that on one occasion that station was temporarily crippled, very probably by heavy sending at the Marconi long-distance station a few miles away.

It would appear that the Weather Bureau already has a station at one of the most important points on the Pacific coast, where the Navy Department desires to erect one and equip it with more powerful apparatus than now in use by the Weather Bureau. The Weather Bureau also intended putting in new apparatus, it having been demonstrated that that now in use is unable to communicate with the nearest naval station in San Francisco Bay, although the latter has sufficient power to reach far beyond the Farallons. This is one of the places where the Pacific Wireless Telegraph Company is so anxious to locate.

The Weather Bureau also contemplated establishing stations at prominent points where the Navy Department already has stations in operation or proposed to establish them. Most of the stations proposed by the wireless-telegraph companies are to be located at prominent points where Government stations are already established or proposed. This state of affairs seems to demand prompt action to avoid most unfortunate confusion and unnecessary duplication.

As a first step toward avoiding this condition the Board adopted the following resolution:

"*Resolved*, That all installations of Government wireless-telegraph stations be suspended except at stations now under contract, until the final report of the Board is acted upon by the President. That all Departments of the Government interested in wireless telegraphy should refuse to allow any private company to install a station on any Government reservation until so authorized by proper authority."

CONCLUSIONS.

The conclusions of the Board are:

That the science of wireless telegraphy has been advanced by the able and persistent work of the Signal Corps of the Army and the Weather Bureau of the Department of Agriculture, as well as by the experimental work of the Navy Department;

That wireless telegraphy is of paramount interest to the Government through the Navy Department, and that its use by the Signal Corps of the Army for communication between military posts of the Army and other necessary links will be necessary both in peace and war, and that such use shall be unrestricted. When interference seems probable between stations of the Navy and War Departments, the question involved shall be mutually settled by representatives of the two Departments;

That coastwise wireless telegraphy is not a necessity for the work of the Weather Bureau of the Department of Agriculture, provided that the necessary meteorological data for that Department can be collected by the stations of the Navy Department from ships at sea and by them sent to the Weather Bureau of the Department of Agriculture;

W.

Section 2, act of October 1, 1890 (26 Stat. L., 653), reads as follows:

The Chief Signal Officer shall have charge, under the direction of the Secretary of War, of * * * the construction, repair, and operation of military telegraph lines, and the duty of collecting and transmitting information for the Army by telegraph or otherwise.

X.

Section 3, act of October 1, 1890 (26 Stat. L., 653), reads as follows:

That the Chief of the Weather Bureau, under the direction of the Secretary of Agriculture, on and after July first, eighteen hundred and ninety-one, shall have charge of the forecasting of weather, the issue of storm warnings, the display of weather and flood signals for the benefit of agriculture, commerce, and navigation, the gauging and reporting of rivers, the maintenance and operation of seacoast telegraph lines, and the collection and transmission of marine intelligence for the benefit of commerce and navigation, the reporting of temperature and rainfall conditions for the cotton interests, the display of frost and cold-wave signals, the distribution of meteorological information in the interests of agriculture and commerce, and the taking of such meteorological observations as may be necessary to establish and record the climatic conditions of the United States, or as are essential for the proper execution of the foregoing duties.

Y.

The Supreme Court, in its October term, 1886, in Telegraph Company *v.* Texas, said:

A telegraph company occupies the same relation to commerce as a carrier of messages that a railroad company does as a carrier of goods. Both companies are instruments of commerce, and their business is commerce itself.

Z.

FINAL PROTOCOL.

The delegations to the preliminary conference concerning wireless telegraphy designated below:

Germany, Austria, Spain, the United States of America, France, Hungary, Russia are unanimous in proposing to their Governments to examine the following general bases for an international convention:

ARTICLE I.

Exchange of correspondence between ships at sea and coastwise wireless telegraph stations opened to general telegraphic service, is subject to the following rules:

SECTION 1. All stations whose field of action extends to the sea are called coastwise stations.

SECTION 2. Coastwise stations are required to receive and transmit telegrams originating on ships at sea without distinction as to the systems of wireless telegraphy employed by said ships.

SECTION 3. The contracting states make public the technical points of a nature to facilitate and accelerate communication between coastwise stations and ships at sea.

However, each of the contracting Governments can authorize stations situated in its territory, under such conditions as it may deem proper, to utilize several installations or special arrangements.

SECTION 4. The contracting states declare their intention to adopt, in order to establish the tariffs applicable to telegraphic service between ships at sea and the international telegraphic system, the following bases:

The total charge to collect for this service is established by the word. It comprises:

(a) The charge for transmission over the lines of the telegraphic system of which the amount is that fixed by the international telegraph regulation in force attached to the St. Petersburg Convention.

(b) The charge pertaining to the marine transmission.

The latter is, as the former, fixed by the number of words, this number of words being counted according to the international telegraphic rule as indicated in the paragraph above (a).

It comprises:

1° A charge called "charge of the coastwise station," which goes to said station;

2° A charge called "charge of the ship," which goes to the station installed on the ship.

The charge of the coastwise station is subject to the approval of the state on whose territory it is established, and that of the ship to the approval of the state whose flag the ship carries.

Each of the two charges should be fixed on the basis of equitable remuneration for the telegraphic work.

ARTICLE II.

A regulation which will be attached to the proposed convention will establish rules for the exchange of communications between coastwise stations and those placed on board ship.

The prescriptions of this regulation may at any time be modified by common agreement by the administrations of the contracting Governments.

ARTICLE III.

The rules of the telegraphic convention of St. Petersburg are applicable to transmission by wireless telegraphy in so far as they are not contrary to those of the proposed convention.

ARTICLE IV.

Wireless telegraph stations should, unless practically impossible, give priority to calls for help received from ships at sea.

ARTICLE V.

The service of operating wireless telegraph stations should be organized, as far as possible, in a manner not to interfere with the service of other stations.

ARTICLE VI.

Contracting Governments reserve to themselves, respectively, the right to make special arrangements between themselves, having for their object to oblige the companies operating wireless telegraph stations in their territories to observe, in all their other stations, the prescriptions of the proposed convention.

ARTICLE VII.

The prescriptions of the proposed convention are not applicable to the wireless telegraph stations of the state not open to general telegraphic service, save in that which concerns the clauses which Articles IV and V are intended to cover.

ARTICLE VIII.

Countries which have not joined the proposed convention will be admitted at their request.

Done at Berlin August 13, 1903.

(Then follow signatures of delegates for Germany, Austria, Spain, the United States of America, France, Hungary, Russia.)

DECLARATION OF THE DELEGATION OF GREAT BRITAIN.

While engaging itself to submit the above bases to the examination of its Government, the British delegation declares that in view of the situation in which wireless telegraphy finds itself in the United Kingdom this delegation ought to maintain a general reserve. This reserve relates especially to section 2 of the 1st article and to the application of the rules of Article V to the stations indicated in Article VII.

Done at Berlin August 13, 1903.

(Signatures follow.)

DECLARATION OF THE ITALIAN DELEGATION.

The delegation of Italy while agreeing to submit to the examination of its Government the propositions contained in the final protocol of the conference, ought, agreeably with the declarations made by its members in the several meetings, to make on account of the Government the following reservations:

Article 1st, Section 2.

It would accept the proposed text only on condition of the following addition being made: "Provided that all these systems give a known guarantee for good working in reciprocal correspondence with respect to the range, to the perfection of the organization, and to the surety of communications."

Article 1st, Section 3.

It cannot accept the first paragraph of this section because in the agreements concluded with M. Marconi the Government engages to keep the details of the installations secret.

Article VI.

It cannot accept the text of this article and it should limit itself to the declaration on the part of its Government it will endeavor to introduce in the agreements stipulated with M. Marconi some modifications in the desired direction.

Done at Berlin August 13, 1903.

(Signatures follow.)

LIST OF INCLOSURES.

1. Letter from the Secretary of the Navy, dated June 18, 1904, marked "B."
2. Letter of June 13, 1904, to the Secretary to the President from the secretary to the Secretary of War, marked "C."
3. Memorandum in regard to wireless telegraphy from the Secretary of the Department of Agriculture, with an indorsement by the Secretary of War, marked "D."
4. Letter from the Acting Secretary of the Navy to the President, dated May 13, 1904, marked "E."
5. Letter from the General Board forwarded with the above, marked "F."
6. Letter from the Bureau of Equipment, Navy Department, forwarded with the above, marked "G."
7. Letter from the Secretary of Agriculture, marked "H."
8. Letter from the Navy Department, dated June 22, 1904, marked "I."
9. Subjects for consideration by an Inter-Departmental Board on Wireless Telegraphy, forwarded with the above and marked "J."

B.

NAVY DEPARTMENT,
Washington, June 18, 1904.

SIR: After reading the indorsement of the Secretary of War on the within papers I respectfully suggest the following: It seems that economy and good administration forbid duplication of such work as that of wireless telegraphy. The control over all Government wireless telegraphy ought, I submit, to be vested in one Department. The control being in one Department, the work done may serve all Government uses. If it be conceded that the control of wireless telegraphy should be vested in a single Department, it seems clear that that Department should be the Navy Department. The reasons for this are so obvious that they do not require restatement.

Very respectfully,

WILLIAM H. MOODY,
Secretary.

The PRESIDENT.

C.

WAR DEPARTMENT,
Washington, June 13, 1904.

MY DEAR SIR: I beg to acknowledge the receipt of your favor of the 14th of May, inclosing papers concerning the question of the control of wireless-telegraph stations.

The Secretary has placed a memorandum for the President on the back of the papers, which I return herewith.

Very respectfully, yours,

FRED W. CARPENTER,
Private Secretary.

Hon. WM. LOEB, Jr.,
Secretary to the President.

D.

Memorandum in regard to wireless telegraphy.

* * * * * * *

This Department now has in operation 38 meteorological observatories on the Atlantic, Gulf, and Pacific coasts, each one manned by from one to six observers, where meteorological observations are taken in the interests of agriculture and storm warnings displayed for the benefit of commerce. At 13 of these places the Department owns its own observatory buildings, and at several of these stations vessels are reported and communicated with by flags and other signals. Every station on the Atlantic, Gulf, and Pacific coasts has been established for the purpose of enabling our meteorologists to promulgate forecasts for the benefit of the farmers in the interior, and the work done for the marine interests is only incidental, but it is economically accomplished, because the officials at these stations can accomplish the marine work in addition to their meteorological duties.

The observatory buildings owned by the Department are located at Nantucket, Mass., Narragansett Pier, R. I., Block Island, R. I., Atlantic City, N. J., Cape Henry, Va., Hatteras, N. C., Kitty Hawk, N. C., and Jupiter, Fla., on the Atlantic coast; Key West, Fla., and Sand Key, Fla., on the Gulf of Mexico; the Farallone Islands, Point Reyes, Cal., North Head, Wash., Tatoosh Island, Wash., and Port Crescent, Wash., on the Pacific coast; and at Duluth, Minn., and Sault St. Marie, Mich., on the Great Lakes. At each of the stations operated by the Weather Bureau on our coasts there is a well-trained and thoroughly disciplined force, which, in time of war or emergency, could report vessels of war as readily as it now reports vessels of commerce. The system could, on short notice, and comparatively slight expense, be amplified so as to cover all of the unprotected portions of our extensive coast line. All these stations, and any other that the Army and Navy consultation board might deem necessary in time of war, could, in time of peace, be economically and profitably used by the Department of Agriculture in the taking of meteorological observations, the displaying of storm warnings, and the reception and transmittal of vessel reports. Such additional stations would be established by this Department on the receipt of the request of either the War Department or the Navy Department.

The Department of Agriculture owns and operates ten cable and land-line telegraph systems for the collection and dissemination of marine information. The authority for this Department to establish and operate marine reporting stations in connection with its meteorological service, and to construct and operate cables and land lines, is shown in the act of Congress approved October, 1890 (see Statutes at Large, Fifty-first Congress, p. 653), as follows:

"SEC. 3. That the Chief of the Weather Bureau, under the direction of the Secretary of Agriculture, on and after July 1, 1890, shall have charge of the forecasting of weather, * * * the maintenance and operation of seacoast telegraph lines, and the collection and transmission of marine intelligence for the benefit of commerce and navigation, * * * ."

As an illustration of the efficiency of the vessel-reporting work of this Department, it may be said that at Cape Henry, Va., alone. 5,613 vessels were reported during the six months ended March, 1904, while at Sand Key, Fla., during the same period, 585 vessels were reported, although this latter station has been in operation less than one year.

The Department of Agriculture has a wireless-telegraph system in operation between the southeast Farallon Islands and Point Reyes, Cal., and additional instruments will soon be installed for communication between Tatoosh Island and Port Crescent, Wash., a distance of 60 miles. The station on the Farallon Islands reports vessels bound into and out of San Francisco harbor, while the station at Tatoosh Island reports vessels that enter and go out of the Straits of San Juan de Fuca. It is the intention, as soon as practicable, to establish wireless telegraphy stations at Sand Key, Fla. (located in the Gulf of Mexico and 9 miles from Key West), at Jupiter, Fla., at Hatteras, N. C., at Cape Henry, Va., and at Nantucket, Mass., or Block Island, R. I.

If the needs of commerce and the protection of our country in times of peace or war should require that the United States Government control and operate seacoast wireless telegraph stations, I would respectfully submit that the Department of Agriculture is equipped to efficiently establish and operate such stations, and information as to the passing of ships of commerce or vessels of war would be furnished to the Navy Department as accurately and as expeditiously as it is possible to do such work. It may not be amiss to state here that the first knowledge of the arrival of the battleship Oregon in our Atlantic waters during the Spanish-American war was given by the Weather Bureau officials at Jupiter, Fla.

Respectfully,

JAMES WILSON.

[Indorsement.]

JUNE 13, 1902.

To the PRESIDENT:

After reading the report of the Secretary of Agriculture I am by no means certain that the Navy Department ought to have control of all governmental stations for wireless telegraphy. It seems to me that it would be sufficient for the joint Naval and Army Board in time of peace to keep a record of all stations, both public and private, with power in the Navy Department to assume control of them in time of war. Provision as to control of private stations would probably need legislative action.

WM. H. TAFT, *Secretary of War.*

E.

NAVY DEPARTMENT, *Washington, May 13, 1904.*

SIR: Referring to the memorandum of the Secreta y of Agriculture in regard to wireless telegraphy, forwarded to this Department on the 22d ultimo by your direction, with a view to having it submitted to the General Board for comment, I have the honor to return herewith the memorandum in question, accompanied by a copy of a report of the General Board (No. 419) dated the 2d instant, on the subject, together with a copy of a letter on the same subject addressed to the Secretary of the Navy by the Chief of the Bureau of Equipment (No. 88863, March 7, 1904).

Very respectfully,

CHAS. H. DARLING, *Acting Secretary.*

The PRESIDENT.

F.

No. 419.]

NAVY DEPARTMENT, GENERAL BOARD,

Washington, May 2, 1904.

SIR: The General Board has the honor to submit the following report on a memorandum by the Secretary of Agriculture in regard to wireless telegraphy, which was referred to it for comment by direction of the President. The General Board forward also a letter on the same subject addressed to the Secretary of the Navy by the Chief of Bureau of Equipment (No. 88863, March 7, 1904), with the request that it be laid before the President at the same time.

2. The questions are—

Whether or not all wireless-telegraph stations belonging to the Government on or near the seacoast ought to be under a common control?

If so, which Department of the Government can best exercise the control?

What is necessary in order to control private seacoast wireless-telegraph stations?

3. In all this discussion, the term "seacoast" includes all wireless-telegraph stations capable of communicating with ships at sea, whatever their actual distance inland, and includes the Great Lakes and the insular possessions of the United States, as well as the Atlantic, Gulf, and Pacific coasts.

4. The following facts must, in the opinion of the General Board, form the basis of the decision:

5. The principal defect of wireless telegraphy, the liability to interference, renders some central control indispensable to the integrity and effectiveness of any wireless-telegraph station. Without control over the placing of other stations, any wireless-telegraph station may be rendered absolutely useless either by accident or design.

6. The control of all wireless telegraph stations belonging to the Government can be accomplished by Executive order. In order to control private stations, general legislation by Congress will be required, both because wireless telegraphy bridges the boundaries between States and because it stretches beyond the territorial limits of the nation.

7. The principal use of wireless telegraphy is now, and long will be, at sea—between ship and ship, or ship and shore. On shore other means of communication always exist, often better, always possible substitutes. The common telegraph or telephone, or the heliograph, permanent or portable, is everywhere available to the soldier or the meteorologist. Permanent outlying stations can be connected by submarine cables. Although wireless telegraphy may be an added convenience, on shore it never can be indispensable. But from ships at sea, out of sight of flags or lights, and beyond the sound of guns, the electric wave, projected through space, invisible and inaudible, can alone convey the distant message.

8. In the present state of the science, development and experiment must be carried on largely at sea. We know as yet little of the limitations or possibilities of marine and transmarine communication. The Navy is the only department of the Government that has facilities for this branch of the work, and, irrespective of what is done by other Departments, the Navy must, in its own interest, continue to experiment and to communicate between its ships and the shore.

9. To the Navy wireless telegraphy is absolutely essential. All the battle ships and larger cruisers, perhaps even torpedo boats, are or will be equipped with it—as foreign navies are—to communicate with each other, as well as with the shore.

10. The Navy has already 20 wireless-telegraph stations on the seacoast and proposes to establish no less than 60 more. The Navy has already made arrangements to receive at its stations and to transmit over the land telegraph lines wireless messages from passing merchant vessels. The Army has 2 stations in use in Alaska, and 2 others for experimenting, and has considered placing 1 at the Golden Gate on the Pacific coast. The Weather Bureau has 2 stations and proposes to erect 7 more. All these stations, except the 2 in Alaska, which are for communicating with each other, are for the purpose of communicating between ships at sea, or in a few cases outlying islands and the mainland. Several of the Army and Weather Bureau stations interfere, or will interfere, with those of the Navy.

11. From these facts it appears clear that it would be in the interest of all to put the seacoast wireless-telegraph stations belonging to the Government under the control of one Department. That control must extend to the determination of sites, and probably to the choice of systems, in order to prevent the several Departments from frustrating one another's efforts. It does not seem to the General Board that there will be much difference of opinion on this question.

12. It remains to consider which Department can best exercise control. For the reasons given—that the Navy has the preponderant interest in wireless telegraphy; that to the Navy it is indispensable, to other Departments merely accessory; that the Navy alone has facilities for experimenting with seacoast stations, and, whatever

other Departments do, the Navy must continue to experiment; that the Navy already has five times as many seacoast stations as all other Departments of the Government together—for all these reasons, the General Board is of the opinion that the Navy should exercise such control over the placing of all Government seacoast wireless-telegraph stations as to prevent their mutual interference. It is better and simpler for the Department that has the predominating interest, even if it does not actually operate all the Government stations, to control their positions, rather than to attempt to exercise control by mutual agreement.

13. But if more than one Department is to operate wireless-telegraph stations on the seacoast, duplication and interference are inevitable. The two existing wireless-telegraph stations of the Weather Bureau and the one proposed by the Army prevented the Navy from establishing its own station in the best place to communicate between ships at sea and the principal navy-yard on the Pacific coast. Several of the new stations proposed by the Weather Bureau are on sites already occupied by the Navy, or within their range of interference; and all the rest would clash with stations projected by the Navy. A promontory best for the Weather Bureau is likely to be best for the Navy. For the purpose of receiving wireless telegrams from ships at sea, the same seacoast station best serves the need of all concerned. Obviously then, it is more economical that the Department that controls the placing of all Government seacoast wireless-telegraph stations should operate them all.

14. It would, in the opinion of the General Board, be far easier for the Navy to transmit the messages of the Weather Bureau than vice versa. The seacoast wireless stations of the Weather Bureau are now but a tenth, and with the new stations planned will still be less than half, as many as the Navy has already. Granting that the Weather Bureau would be willing, as the Secretary of Agriculture says, to establish the great number of additional seacoast stations needed by the Navy, and that its observers now efficiently report the movements of shipping, there are still two important reasons why the Navy can not depend, either in peace or war, upon stations controlled by the Weather Bureau:

(1) It is absolutely necessary in time of war that the observers stationed to receive messages from the fleet should be subject to military law—that is, enlisted men of the Navy. Civilian marine observers, however skillful in reporting merchant ships, could not so well be trusted to distinguish the wireless messages of friendly from hostile men-of-war, or to transmit accurately technical naval signals, and could not be trusted at all with the secret signal codes of the Navy. Whoever mans the seacoast stations in time of peace, the Navy must man them in time of war.

(2) Unless the Navy mans the stations in time of peace it will not have the trained force ready to man them in time of war. Practice with instruments on shipboard alone will not suffice. The man to be trusted at a seacoast station in time of war, alert to detect the unexpected, must be familiar with the usual local business in time of peace. The opportunity for training the signalmen is no less important than testing the apparatus.

15. The single instance cited by the Secretary of Agriculture of the weather observer at Jupiter Inlet reporting what he saw and having the good fortune to be the first to see the arrival of the *Oregon* is far from proving that the Navy can trust to anyone but its own trained men to receive wireless signals from ships at sea. From every point of view, therefore, it appears to the General Board that the seacoast wireless-telegraph stations of the Government are essential to the Navy and to no other Department; and the General Board therefore concurs in the recommendation of the chief of Bureau of Equipment that an Executive order be issued placing them all under naval control, to be manned and operated by the Navy.

16. The subject of legislation to control private wireless-telegraph stations on the seacoast is of growing importance to the Government because of the increase in the number of them and their liability to interfere, maliciously or accidentally, with the Government's stations. In order to safeguard its own interest, both in peace and war, the Government must have some means to prevent the erection of a private wireless-telegraph station within the range of interference of one of its own. It would not be wise, in the opinion of the General Board, for the Government to undertake to manage all the seacoast wireless-telegraph business of the country, nor for an industry of such growing commercial utility to be controlled directly by a military branch of the Government. The Department of Commerce and Labor, now charged with the administration of the light-house service, the coast survey, the inspection of steamboats, and the jurisdiction over merchant shipping generally, would perhaps be the most natural one to control private wireless-telegraph companies. The law should clearly give the Government priority of right and prohibit the erection of any private station without the approval of the Government.

Very respectfully,

George Dewey,
Admiral of the Navy, President General Board.

The Secretary of the Navy.

(G)

No. 88863.]

NAVY DEPARTMENT, BUREAU OF EQUIPMENT,
Washington, D. C., March 7, 1904.

SIR: 1. The Bureau having successfully established a number of wireless-telegraph stations on the coast of the United States and in Porto Rico, and believing that the great utility of these stations has been proven in connection with wireless-telegraph equipments on board our ships, invites the Department's attention to the importance of taking early steps to complete a chain of stations around the entire coasts of the United States and its insular possessions.

2. With a comprehensive scheme of stations laid out, the Bureau thinks that a foothold should be obtained without unnecessary delay so as to prevent priority of right to certain desirable locations being acquired by other Departments, private corporations, and individuals. On account of the principal defect of wireless telegraphy, i. e., liability to interference, this may become a very important consideration. The Bureau has already encountered serious trouble due to interference, which at times seems malicious, in the vicinity of New York. The station at the Boston yard is within the range of private stations which can seriously interfere with it. A report from the commandant of the naval station, Key West, received to-day, states that a private station is being erected at about a mile from the Department's station at that place, which will have the power to seriously interfere with communication between Key West, Dry Tortugas, ships, and Bahia Honda (should the Department erect a wireless-telegraph station there when the coal depot is established). Other private stations with the power of interference with naval wireless-telegraph stations will probably soon be established unless some legislation is enacted to prevent. Of course the Government can control private stations in time of war by exercise of martial law, but probably at considerable expenses for damages to the interests involved. Some legislation to control interference from them in time of peace is of growing importance and ought to receive early consideration.

3. Owing to the fact that the principal use to which wireless telegraphy is likely to be put for many years is connected with the sea, and on account of the confusion that may arise from numerous independent stations being established in the same locality, the Bureau is of opinion that it would be advisable to put all Government wireless stations on or very near our seacoast under the Navy Department, and, perhaps, to have the Government take control of the entire wireless-telegraph service along the coast, as some foreign governments do with the land-telegraph service.

4. The Bureau began in 1902 to establish stations at Mare Island and Yerba Buena Island, in San Francisco Bay, and to negotiate for a site on Point Bonita, at the entrance of this bay, but, after a correspondence lasting over a year, it abandoned this idea, owing to a desire of army officers to establish a station in the vicinity, the Point Bonita light-house being on a military reservation. The Bureau then turned its attention to the idea of erecting a station on South Farallone Island, off the entrance to San Francisco Bay. This also was abandoned, owing to the fact that the Department of Agriculture had established a station there and suggested that it would be undesirable for another one to be erected near it. As a result of these objections the Navy Department (which is most dependent upon wireless telegraphy) is placed in a position of having to depend on stations operated by men not under its control (and, in one case, not even under military authority) for the transmission of signals between its vessels at sea beyond the range of the station on Yerba Buena and one of its most important naval bases.

5. Commander F. M. Barber, U. S. Navy, retired, the Bureau's representative abroad for collecting information relating to wireless telegraphy, speaks of its utility for naval purposes as follows:

"But for maritime purposes it is simply invaluable in spite of its defects.

"Navies are the only Government branch that can develop it, for though they do not own the earth they do own the sea, and their facilities for experiment are far greater than those of any other branch of the Government or of any private manufacturer or corporation. All the continental navies are very secret as to their results.

"It is the varying atmospheric perturbations that are troubling everybody. There seems to be no difficulty now with good apparatus under favorable circumstances; but it is evident that there must be persistent and continuous observations about the coast line of each country in order to determine all its idiosyncrasies, and these again probably differ from what will be found in mid-ocean."

6. In connection with Commander Barber's statements attention is invited to the recent loan of the cruiser *Carlo Alberto* to Marconi by the Italian Government for experiments between Poldhu, England, and that ship while en route to Cronstadt, Russia, and afterwards on this side of the Atlantic, and the long-distance experiments of the H. M. S. *Duncan*, of the British navy, and also to the importance of a ship being put at the disposal of the Bureau for similar employment.

7. In conclusion, the Bureau earnestly recommends that the Department take up:

First. The subject of obtaining an Executive order placing all wireless-telegraph stations belonging to the Government, on or very near the seacoast, under naval control.

Second. The subject of legislation for the control of private wireless-telegraph stations or their abolition on the coast.

Very respectfully,

G. A. Converse,
Chief of Bureau.

The Secretary of the Navy.
(Through the General Board.)

(H)

Department of Agriculture,
Office of the Secretary,
Washington, D. C., June 22, 1904.

Dear Sir: I respectfully nominate Willis L. Moore, Chief of the Weather Bureau, for representative of the Agricultural Department on the wireless-telegraphy board.

Sincerely,

James Wilson.

The President.

(I)

Navy Department,
Washington, June 22, 1904.

Sir: In obedience to your order, I have the honor to designate, as the representatives of this Department upon the board to be constituted for the consideration of wireless telegraphy, Rear-Admiral Henry N. Manney, U. S. Navy, Chief of the Bureau of Equipment, and Lieutenant-Commander Joseph. L. Jayne, U. S. Navy, and in further compliance with your order I forward a draft of proposed instructions to be issued to the board, which is herein inclosed.

Very respectfully,

William H. Moody.

The President.

(J)

Subjects for consideration by an interdepartmental board on wireless telegraphy.

Navy Department, Bureau of Equipment,
June 22, 1904.

First. Whether, in the interest of governmental economy and efficiency and in order to prevent unavoidable interference, it is advisable to place all wireless-telegraph stations belonging to the Government on or near the coasts of the United States and its insular possessions under one Department, and if in the opinion of the board it is advisable to do so, to recommend the Department under which they should be placed, or if not to recommend a plan of interdepartmental cooperation in the matter of installing, maintaining, and operating wireless-telegraph stations economically, efficiently, and with as little friction as possible.

Second. Whether, in order to prevent unavoidable or intentional interference between Government and private stations, or between private stations situated in the same locality and from considerations of national defense in time of war, it is necessary or desirable for the Congress to enact legislation to regulate and control the use of wireless telegraphy within the territory of the United States and its insular possessions, and if any such legislation is considered necessary or desirable to recommend its nature.

Third. Whether, because international questions may arise, due to the fact that the use of wireless-telegraph stations in our own possessions may affect the use of similar stations in foreign countries, it is necessary or desirable for the Congress to enact legislation which will enable the Government properly to handle such cases, should they arise, and if so, to recommend the nature of such legislation.

MARCONI WIRELESS TELEGRAPH COMPANY OF AMERICA,
27 William Street, New York, June 21, 1904.

DEAR SIRS: I beg leave to inform you that our Board is prepared to contract with the Bureau for the use of our system as required by the Bureau on terms based on the following lines:

1. That the Bureau shall be entitled to use apparatus of the Marconi system having a maximum range of 240 miles, for naval stations on shore in the United States of America and dependencies, and on board United States vessels, at a yearly royalty of $50,000 per annum, which annual royalty shall entitle the Bureau for the duration of this contract, to the use of all the Marconi apparatus and inventions now in use or which may be acquired later, applicable to such stations.

2. That the Bureau will install apparatus of the Marconi system at their stations, paying therefor the current market price, it being understood that the royalty mentioned above shall cover all claims by the Marconi company for royalty on apparatus installed by the Bureau.

3. That the Bureau will, as far as may be possible, agree to accept messages from vessels equipped with Marconi apparatus and will make such arrangements at naval stations as will

(*a*) Enable intercommunication with vessels of the mercantile marine equipped with the Marconi system.

(*b*) As will prevent the interference with vessels of the mercantile marine equipped with the Marconi system when communicating with naval vessels.

4. That the Marconi company agrees to give the Bureau certain preferential rights in the dispatch of naval messages over ordinary messages from their commercial stations now existing or established in the future, which shall, at the convenience of the Marconi company, remain in operation for the benefit of the Marconi company.

5. That the Bureau shall use such powers as they may have from time to time to prevent the interference by other systems with Marconi commercial stations and with naval stations, working either together or independently.

6. Except in time of emergency or war or in the case of war vessels, the Bureau shall not use the Marconi wireless apparatus fitted at their stations for the interchange of signals with vessels or stations not equipped with apparatus provided by the Marconi company.

7. That the Bureau shall have the use of a long-distance station (which term is understood to mean a station capable of transmitting a message 500 miles and upward to vessels fitted with suitable receivers) at certain periods on certain terms.

8. That the period of the contract shall be for a number of years, which will be determined after consultation with the Bureau.

Referring to No. 1, we have considered it advisable to ask for a consideration which does not depend on the number of sets of apparatus actually required, and as we understand that the Bureau may require some hundreds of sets in the course of time, we hope that our proposal will commend itself to the Bureau.

Re clauses 2 and 3, it is important that shore stations equipped by the Bureau should be able to communicate, when desirable, with vessels of the mercantile marine, and also that the Marconi commercial stations should be able to communicate with vessels of the United States Navy when desired.

When it is not desired to communicate between the two classes of stations, specially designed apparatus will be used, and we have made reference to such prevention of interference in condition No. 3.

Re No. 4, this company will be prepared to make such reasonable arrangements for communicating with vessels of the Navy from its commercial stations as the Bureau may desire, which will also enable the Bureau to have the first call on those stations when necessity arises.

Referring to No. 6, it is in the interests of the Bureau, and more particularly in the interests of navigation and commerce, that the system in general use should be adopted. Various Marconi circuits can be used within the same area for different purposes simultaneously without interference; but we are unable to guarantee that our working will not interfere with the working of apparatus of other design, nor can we guarantee that the operation of other apparatus of other design will not interfere with the apparatus that we intend to install at naval stations.

The important point is not whether interferences are possible, but whether different apparatus can be operated for different purposes within the same area simultaneously without interference. By the adoption of our apparatus the Bureau will be able to do this, but communication must be confined to such circuits; it is essential, in order that the scope and utility of the Marconi apparatus may not be reduced, that communication shall be so confined.

In offering our apparatus to the Bureau we desire to say that we are working different apparatus for different commercial purposes in the United States of America, and believe that no tests or demonstrations carried out at stations erected for that purpose can equal in value the demonstrations of such ordinary commercial work as is being carried on every day for different purposes. We shall, however, not only be happy to place at the disposal of the Bureau our stations working commercially, but shall be prepared, subject to an agreement of terms, to make special demonstrations for the satisfaction of the Bureau, and we beg to propose the following:

1. To demonstrate the reception of messages, in code or otherwise, on board a United States vessel, during the whole voyage across the Atlantic from one shore to the other.
2. Regular communication both ways between a shore and a ship station up to about 200 miles.
3. Simultaneous operations within the same area without interference.
4. The reception in New York of messages dispatched from a station considerably over 200 miles distant.
5. Such other reasonable tests as the Bureau may require.

Referring to test No. 2, we understand that it is the particular desire of the Bureau to install apparatus at shore and ship stations capable of communicating reliably over a distance of about 200 miles. We shall be glad to supply such apparatus, and would accept as a condition, precedent to a contract, that we demonstrate our ability to do so on a United States vessel fitted for that purpose.

Referring to test No. 4, we understand that it is the particular desire of the Bureau to satisfy itself that our apparatus can efficiently communicate across an area in which is situated a large city with high buildings and various complicated electrical equipments. We have, therefore, included in our tests the reception of messages in New York from a station situated considerably over 200 miles distant, almost entirely over land.

Yours, respectfully,

MARCONI WIRELESS TELEGRAPH COMPANY OF AMERICA,
By JOHN D. OPPE,
Vice-President and General Manager.

BUREAU OF EQUIPMENT, *Washington, D. C.*

O

63d Congress
2d Session

SENATE

Document
No. 399

Selections from

GOVERNMENT OWNERSHIP OF ELECTRICAL MEANS OF COMMUNICATION

LETTER FROM
THE POSTMASTER GENERAL

TRANSMITTING

IN RESPONSE TO A SENATE RESOLUTION OF JANUARY 12, 1914,
A REPORT ENTITLED "GOVERNMENT OWNERSHIP OF
ELECTRICAL MEANS OF COMMUNICATION," PREPARED BY A COMMITTEE OF THE
POST OFFICE DEPARTMENT

WASHINGTON
GOVERNMENT PRINTING OFFICE
1914

★

REPORTED BY MR. FLETCHER.

IN THE SENATE OF THE UNITED STATES,
February 13, 1914.

Resolved, That Senate Document Numbered Three hundred and ninety-nine, Sixty-third Congress, entitled "Government Ownership of Electrical Means of Communication," be reprinted with the accompanying papers and illustrations submitted by the Postmaster General in response to Senate resolution Numbered Two hundred and forty-two, and that one thousand additional copies be printed, of which five hundred shall be for the use of the Senate document room and five hundred for the Superintendent of Documents at the Government Printing Office, to be sold by him as provided by law.

Attest:

JAMES M. BAKER, *Secretary.*

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LETTER OF TRANSMITTAL.

Post Office Department,
Office of the Postmaster General,
Washington, D. C., January 31, 1914.

Hon. HOMAS R. MARSHALL,
President of the Senate.

My Dear Mr. President: I have received Senate resolution No. 242, reading as follows:

> *Resolved,* That the Postmaster General be, and he is hereby, directed to send to the Senate the results of the investigation he has been making regarding Government ownership and control of means of communication with a view to the acquisition by the Government of the telegraph and telephone facilities, to be operated as an adjunct to the Postal Service, and that in connection therewith he send to the Senate all of the data and information that has been acquired by means of such investigation, together with a copy of all reports that have been made thereon by any committee or persons appointed by him for the purpose of making such investigation.

In compliance with the demand of this resolution I am transmitting herewith the report entitled "Government ownership of electrical means of communication," prepared at my direction by a departmental committee consisting of the First Assistant Postmaster General, the chief clerk of the department, and the superintendent of the Division of Salaries and Allowances of the Bureau of the First Assistant. The report carries as appendices the statistical data assembled and utilized by the committee in the course of its labors and an historical résumé of the agitation for Government ownership of the telegraph and telephone.

I also direct your attention to the following paragraph on this subject in the annual report of the Postmaster General for the fiscal year 1913:

> POSTAL TELEGRAPHS AND TELEPHONES.
>
> A study of the constitutional purposes of the postal establishment leads to the conviction that the Post Office Department should have control over all means of the communication of intelligence. The first telegraph line in this country was maintained and operated as a part of the Postal Service, and it is to be regretted that Congress saw fit to relinquish this facility to private enterprise. The monopolistic nature of the telegraph business makes it of vital importance to the people that it be conducted by unselfish interests, and this can be accomplished only through Government ownership.
>
> The act of July 24, 1866, providing for the Government acquisition of the telegraph lines upon payment of an appraised valuation and the act of 1902 directing the Postmaster General "to report to Congress the probable cost of connecting a telegraph and telephone system with the Postal Service by some feasible plan" are evidences of the policy of this Government ultimately to acquire and operate these electrical means of communication as postal facilities, as is done by all the principal nations, the United States alone excepted.
>
> The successful operation of the parcel post has demonstrated the capacity of the Government to conduct the public utilities which fall properly within the postal provision of the Constitution.
>
> Every argument in favor of the Government ownership of telegraph lines may be advanced with equal logic and force in favor of the Government ownership of telephone lines. It has been competently decided that a telephone message and a telegram are the same within the meaning of the laws governing the telegraph service; and therefore it is believed that the statute enabling the Government to acquire, upon the payment of an appraised valuation, the telegraph lines of the country, will enable the Government to acquire the telephonic network of the country. While it is true that the telephone companies have not complied with the requirements of section 5267, Revised Statutes, this can not be held to nullify the intent of the law, since the nonperformance on the part of the Government of any of its constitutional privileges in nowise surrenders the right to exercise these privileges whenever the best interests of the Nation demand.
>
> Since June last the department has been conducting a careful investigation to determine the desirability and practicability of extending the Government ownership and control of means of communication, with a view to the acquisition by the Government of the telegraph and telephone facilities, to be operated as an adjunct to the Postal Service. The Postmaster General is now engaged in reviewing the data collected, and later, if desired, will submit same to the appropriate committees of Congress for their consideration.

Very sincerely,

A. S. Burleson,
Postmaster General.

GOVERNMENT OWNERSHIP OF ELECTRICAL MEANS OF COMMUNICATION.

REPORT TO THE POSTMASTER GENERAL BY A SPECIAL COMMITTEE OF THE POST OFFICE DEPARTMENT COMPOSED OF DANIEL C. ROPER, FIRST ASSISTANT POSTMASTER GENERAL; M. O. CHANCE, CHIEF CLERK, POST OFFICE DEPARTMENT; J. C. KOONS, SUPERINTENDENT, DIVISION OF SALARIES AND ALLOWANCES.

Post Office Department,
Washington, D. C., November 25, 1913.

Hon. A. S. Burleson,
Postmaster General.

Sir: In pursuance of your order No. 7187, dated June 7, 1913, the undersigned committee has the honor to submit herewith its report and recommendations on the desirability and practicability of extending the Government ownership and control of means of communication.

RELATION OF TELEGRAPH AND TELEPHONE SYSTEMS TO THE POSTAL SERVICE.

The founders of this nation were keenly alive to the importance of keeping exclusively under Government control all means of communication, and therefore provided in the Constitution that "the Congress shall have the power * * * to establish post offices and post roads."

The framers of the Constitution probably never dreamed of postage stamps, railway postal cars, canceling machines, pneumatic tubes, telegraphs, telephones, aeroplanes, and radio equipment. They specified nothing concerning means of transportation or methods of distribution, but wisely left to future generations a broad provision under which they would have the right to avail themselves of such improved means of communication as might be discovered and developed. It was clearly their intention that the Government should control all means for the transmission of intelligence.

Under Government control the Postal Service of our country has prospered, expanded, and developed to its present high state of working and economical efficiency, adopting in the course of its growth practically every means of transmitting intelligence except electricity. The service has gone hand in hand with the advance guard of civilization. Its facilities have been extended to the smallest and remotest towns and villages in our land, not with regard to cost or with an eye to profit, but with the sole purpose of serving the needs of the people irrespective of wealth or position.

The United States alone of the leading nations has left to private enterprise the ownership and operation of the telegraph and telephone facilities.

In 1843 this Government aided in the construction and assumed as a part of its postal duties the operation of the first electric telegraph. But on March 4, 1847, because of the unwillingness of Congress to authorize any extension of the service then in operation and because of a deficit in the postal finances, the control of this facility was surrendered to private hands. However, in 1866, Congress, aware of the danger of permitting this service to remain under private control in view of its intimate relation to the postal service, asserted that the facility was within the purview of the constitutional provision for the postal establishment, and enacted legislation looking to the acquisition by the Government of all telegraph lines.

With an indecision that is to be regretted the fulfillment of this commendable purpose was deferred for a period of five years in order that the telegraph monopoly might during that time be indemnified by the continued enjoyment of its exorbitant rates for the loss of its grip upon the public means of transmitting intelligence.

The relation of the telegraph to the postal service can not be better described than by quoting the following clear and succinct statement of Postmaster General Howe in his report for the fiscal year 1882:

> The business of the telegraph is inherently the same as that of the mail. It is to transmit messages from one person to another. That is the very purpose for which post offices and post roads are established. The power to establish is not limited to any particular modes of transmission. The telegraph was not known when the Constitution was adopted. Neither was the railway. I can not doubt that the power to employ one is as clear as to employ the other.

Numerous other Postmasters General of the United States have advocated the acquisition of the telegraph and telephone systems of the country, and their comments and recommendations are epitomized in the historical résumé which accompanies this report as Appendix A.

What has been said in favor of Government ownership and operation of the telegraph applies with equal force to the telephone service. As in the case of the telegraph, this Government might properly have taken up and operated in connection with the postal service the first telephone system of the country. This judgment is confirmed by the experience of the British Government.

Section 4 of the British telegraph act of 1869 provides that—

> The postmaster general by himself or his deputies and his and their respective servants and agents shall have the exclusive privilege of

transmitting telegrams within the United Kingdom of Great Britain and Ireland, except as hereinafter provided; and shall also within that Kingdom have the exclusive privilege of performing all the incidental services of receiving, collecting, or delivering telegrams, except as hereinafter provided.

In a lawsuit to determine the question the highest courts of Great Britain held, on December 20, 1880, that a telephone is a telegraph, and a conversation by telephone is a telegram within the meaning of the telegraph act, and that the authority enabling that country to operate the telegraph enabled it also to operate the telephone.

The telegraph and telephone systems have long been recognized as necessary adjuncts to a complete postal service. As with all other privately controlled public utilities, these facilities have been extended in our country only in proportion as the service to be performed has insured substantial dividends for the stockholders. Under private ownership, therefore, the telegraph and telephone are for the classes. Under Government ownership, through the postal machinery, which is conducted in the interest of the whole people and already reaches every man's door, the benefits of these facilities could be extended to the masses.

It is obvious that the longer the acquisition by the Government of these facilities is deferred the greater will be the cost. Moreover, it is economic waste to permit private enterprise to build up vast properties that must eventually be taken over by the Government in resuming its constitutional monopoly at a cost out of all proportion to the value of the parts of such properties that may be utilized to advantage in the postal system.

The study of this subject has disclosed that the telegraph and telephone systems of the country are so inextricably allied that any consideration of the one must necessarily include the other. Your committee has therefore been under the necessity of prosecuting its inquiry beyond the province contemplated by your order and accordingly its report covers both.

TELEGRAPH SERVICE.

According to the best available data, the telegraph plant of this country in 1912 included about 247,000 miles of pole line carrying about 1,800,000 miles of wire. The capitalization of the land wires, segregated, is estimated at $150,000,000; including the ocean wires and submarine cables, the capitalization probably would amount to $220,000,000. So far as the public generally is concerned, the entire telegraph service is owned and operated by two companies, their lines practically duplicating each other in most sections of the country.

Telegraph facilities have not been extended to the small towns and villages along with the Government postal facilities, nor has the cost of the service been reduced in the inverse proportion that would seem to be warranted by the increasing volume of business transacted. Neither has the volume of business in this country, in proportion to the population, been as great as in countries where this facility is owned and operated governmentally. This fact unquestionably is attributable to prohibitive rates and the failure of the companies to extend the service to territory which promises small profits.

An official report of the postmaster general of Great Britain in 1911 shows that between 1869 (the year the British Government took possession of the telegraphs) and 1900 the number of messages handled in that country increased thirteenfold, while the population increased but 30 per cent. During the same period the population of the United States increased 100 per cent, and yet the number of telegraph messages handled increased but eightfold.

In 1912 the number of messages handled in this country was barely in excess of one per capita; in New Zealand, where the telegraphs are owned and operated by the Government, the number was more than eight per capita.

Statistics show that although the United States outranks all other countries in postal transactions per capita, in respect to telegraphs it is outranked by eight other countries.

All of the important countries, the United States, Canada, and Mexico excepted, have bound themselves by an international agreement to observe uniform regulations in the administration of their telegraph service. These regulations, with a view to affording the people the most efficient service at the lowest cost, require the use of the latest and best improvements in the telegraphic art and prescribe the manner and method of receiving, transmitting, and delivering telegrams and the rates of tolls to be collected. The privately owned telegraph companies of the United States, Canada, and Mexico, to the detriment of the people, have remained outsiders to these international rules and regulations.

The United States recently became a party to an international agreement with respect to radiotelegraphy, and in this service bound itself to observe many of the rules and regulations governing the telegraph service in foreign countries. On account of the close relation which must exist between the land telegraph companies and the radio companies great confusion is now resulting from the fact that the United States is bound to observe modern rules and regulations in its radio service, but is compelled to use archaic forms and regulations in its land service because of the attitude of the commercial telegraph companies.

At the International Radio Conference at London in 1912 the delegates from the United States signed the treaty only with the humiliating condition in the protocol that, as the telegraph lines in the United States were owned by private companies, this country must abstain from all regulations concerning tariffs.

EFFECT OF TELEPHONE ON TELEGRAPH SERVICE.

The postmaster general of Great Britain reported in June, 1911, that in 1907 the telegraph traffic of that country commenced to show a diminution, owing to the growing use of the telephone. The like effect in the United States is shown by statistics. The statement below shows the average daily telephone connections of the associated Bell companies between the years 1900 and 1910 and the annual number of messages transmitted by the Western Union Telegraph Co. during the same period.

	Average daily telephone connections of the associated Bell telephone companies.	Number of messages transmitted annually by the Western Union Telegraph Co.
1900	5,817,514	63,167,783
1905	13,912,551	67,477,320
1906	16,940,000	71,847,082
1907	18,624,000	74,804,551
1908	18,962,397	62,371,287
1909	20,342,435	68,053,439
1910	22,294,010	75,135,405

It will thus be seen that during the decade to which the foregoing figures relate, while the population of our country was increasing approximately 18 per cent (actually 17.8 per cent), the average daily telephone connections increased 287 per cent and the number of telegraph messages only 18 per cent. The use of the telephone in all walks of life is steadily increasing, while the use of the telegraph is relatively stationary, and therefore decreasing.

(Statistics showing the traffic of the independent telephone companies and the Postal Telegraph Co. are not available, but investigation indicates that the figures used above represent fairly the relative importance of the telephones and telegraphs.)

The telegraph companies have already lost for the most part the short-distance business owing to the development of the toll-telephone service, and they probably will lose much of the long-distance business when the toll rates become adjusted on a cost basis. Statistics of the telegraph and telephone traffic in foreign countries show that the number of long-distance telephone communications greatly exceeds the number of telegrams. In Germany, for example, the ratio is 6 to 1. Certainly the general trend in the use of wire communication favors the telephone at the expense of the telegraph.

This was undoubtedly foreseen by the telegraph companies some years ago, for it is understood that before the acquisition of the Western Union Co. by the American Telegraph & Telephone Co. the former contemplated improvements in its system whereby the telephone would be added to the telegraph service, and this attitude on the part of the Western Union Co. was an underlying reason why its property was acquired by the Bell interests.

Telephone circuits generally consist of two wires, known as metallic circuits. It is a simple and inexpensive operation to superimpose the telegraph feature on each wire. On the other hand, the telegraph circuit in this country is commonly a single wire with earth return. A large percentage of this is iron wire, which can not be used satisfactorily for long-distance telephone purposes. Therefore, to add the telephone feature to such a circuit would necessitate not only the duplication of the entire wire equipment in order to provide the required metallic circuits, but the substitution of copper wherever iron wire is used. It will thus be seen that although it is practicable and economical to superimpose the telegraph feature on existing telephone circuits, the cost would be prohibitive to do the reverse.

On many of the long-distance telephone lines owned by the American Telegraph & Telephone Co. the telegraph feature has been superimposed and the same wires are to-day carrying both telegraph and telephone communications simultaneously.

TELEGRAPH SYSTEMS INADEQUATE FOR POSTAL NEEDS.

The acquisition of the telegraph service of the country would necessitate taking over the duplicate plants of the two companies controlling this service with their duplicate expenses of maintenance. Unquestionably one could be made to serve the same territory. Furthermore, and of great importance, is the fact that even the entire plants of these two companies would be inadequate for the purpose of the Government, because their facilities have been extended only to profitable territory. Should the Government resume control and operate this service, it would be with the object of extending the facilities in the interest of the people, and hence regardless of profit.

Assuming that the poles of the present telegraph systems would sustain the increased number of wires necessary to superimpose the telephone feature, the expense of constructing, equipping throughout with copper wire, loading the same, and providing the extra circuits required could not be estimated at less than $75,000,000. Add this to the estimated value of the telegraphic land lines ($150,000,000) and it will be seen that the cost would be equal to $225,000,000, or $25,000,000 in excess of the estimated value of the interurban and long-distance telephone network. The expense of equipping the latter system for telegraphy would involve only the cost of the instruments, and would therefore be negligible.

In view of the foregoing it is the opinion of your committee that it would be unwise from a commercial standpoint for the Government to acquire the telegraph systems of the country.

TELEPHONE SERVICE.

The Scientific American Reference Book for 1913 contains statistics showing that in 1912 there were about 18,179,000 miles of telephone wire in operation in this country, serving 8,362,000 telephones. About 2,800,000 miles of this were interurban and long-distance wires and the remainder, about 15,400,000 miles, served the city and town exchanges. Over 70 per cent of this entire mileage is controlled through stock-majority ownerships by an association known as the American Telephone & Telegraph Co. These (Bell) lines constitute about 12,421,000 miles of exchange wires and about 2,189,000 miles of toll wires. More than half of this system is underground.

Mr. Theodore N. Vail, president alike of the Western Union Telegraph Co. and the associated Bell telephone companies, in his announcement of policy states:

"There is a road to every man's door; there should be a telephone to every man's house. * * * Under common control * * * it must be sufficiently strong to constitute practically one system, intercommunicating, interdependent, universal."

This statement is merely a concurrence in the accepted economic doctrine of the monopolistic tendency of the telephone business. The history of this business clearly establishes the futility of competition as a means of regulating its conduct in the interest of the people. Mr. Vail, therefore, naively agrees to the preamble of the economist and fails to follow the line of thought to its inevitable conclusion. The division of opinion between him and practically all of the economists who have given this subject their attention is upon the question whether the monopoly should be public or private. The decision of this question must rest upon which is better for the public welfare.

There is a radical difference between the policies of a public and a private monopoly, both as regards the extension of service and the fixing of rates. In the extension of service the determining factor with the Government is the needs of the people; with the private monopoly, the consideration of profit. The effect of the application of these two policies to similar public utilities is shown by comparison between the present universal extension of the mail facilities and the limited extension of the telegraph and telephone facilities. The private monopoly has no incentive to extend its facilities to unprofitable territory, but the Government must serve all the people. This universal service is accomplished by the equalization of rates. In fixing rates, the policy of this Government is to superimpose no charge for taxation, but only to see to it that the service as a whole is self-supporting. The private monopoly, on the other hand, must make a profit, and in providing for this tends to increase its rates to the highest point that will not, by so greatly restricting the volume of business, impair the aggregate profit. The effect of the policy of private monopoly is aptly described by Prof. Holcombe in his Public Ownership of Telephones on the Continent of Europe. He states:

> The forces of demand and supply will operate under a régime of monopoly, as under one of free competition, but the results will not be the same. In the latter case the interests of the monopolist will ordinarily lead him to fix his rates at a level which is intended to yield him the maximum of profit. Having adopted a tentative schedule of rates, he carefully observes the extent of the demand for his services at those rates and readjusts them, if need be, until the actual sale of his services verifies his calculations. *His purpose always is to make as large as possible the surplus that remains after deducting from his gross receipts all the expenses of rendering the service.* Consequently, under a régime of unregulated private monopoly, rates are certain to be exorbitant.
>
> In the telephone business, to this disadvantage from the viewpoint of the community of monopolies in general, must be added further special disadvantage. *Not only is there no protection against exorbitant rates, but also there is no security that the distribution of the total charges between the different classes of telephone users will be made on a basis calculated to promote the widest utility of the service, such as it is. For the criterion of a sound monopolistic rate policy is not the greatest utility of the service, but the greatest profit of the monopolist.* Unfortunately, the two do not coincide. There will, for example, be no incentive to extend the service to wider circles of users, unless such an extension will increase the gross receipts more than it will increase the operating expenses. The enhanced profits, therefore, which the monopolist will obtain from those users whose demand for the service is least elastic will not be put into extensions for the benefit of those whose demand is more elastic, and to whom, consequently, a small reduction in price would mean a great increase in satisfaction. Monopoly rates will not enable the community at large to derive from the telephone service the maximum of satisfaction. Therefore they are not reasonable rates.

The Bell companies, under the guidance of the American Telephone & Telegraph Co., whose president has been quoted, are working assiduously toward their admitted object—a nation-wide monopoly of the telephone business. This company avails itself of every means of stressing the desirability of having this immense project under the control of one organization, and the necessity for uniform equipment, uniform engineering, and uniform operating practices is scrupulously observed. Only one make of equipment is authorized for use on all of these Bell lines—that manufactured by the Western Electric Co., one of the Bell properties.

In extending their system the Bell companies have refused to connect with other companies on the ground that this would incorporate into their service telephones, switchboards, wires, and other apparatus not in uniformity with those used by them and that such dissimilarity of equipment would result in poor service. They have likewise refused to make such connections on the ground that one central organization *must have control* over the entire system. This attitude on the part of the Bell system has deterred the development of independent systems and has seriously crippled those which have been started.

Unquestionably, from the engineering viewpoint the attitude of the Bell companies is proper, for it is very necessary in the interest of the most efficient service that the entire telephone network be under one management. In the interest of the people, however, it is highly desirable that this management be vested in an unselfish agency like the Postal Service, where the policy would be universal extension at cost rather than limited extension at the maximum of profit.

It is needless here to enter into the manifold advantages and benefits that would accrue to the people from a universal telephone service. The telephone has now become an indispensable aid to business and a means of social intercourse to which all classes properly aspire. As it has done with the mails, it is the duty of the Government to make this facility available to all of its citizens without discrimination.

There is only one other alternative: The enforcement in accordance with law of a condition of competition in the telephone and telegraph business. Without considering whether this could be done effectually in the case of an enterprise inherently so monopolistic, it is sufficient to note that while the execution of such a plan would be fraught with difficulty, its effect would not be to improve service and reduce rates, but the reverse. Competition applied to this public utility has clearly been shown to result in waste and inefficiency due to duplication. Not artificial restraint, but natural development under Government control is the true policy for the public interest.

Maps showing the routes and stations of the telephone systems and those of the Postal Service in this country are strikingly similar, except as regards extent. Hence, in the profitable territory we have three agencies—the mail, the telegraph, and the telephone—engaged in the business of transmitting intelligence and differing only in the modes of transmission.

The Postal Service maintains about 64,000 offices and stations and employs about 290,000 persons. The telephone service maintains about 50,000 offices and employs about 200,000 persons. Were these two services merged and operated under Government control it would be feasible to transfer a large number of the telephone offices to post-office buildings, and thus greatly reduce the aggregate expense for quarters. Furthermore, as the majority of the telephone employees are operators, who require no special technical training, the merging of the two forces would result in a material reduction in the total number of employees required. Furthermore, it is understood that the automatic and semiautomatic equipment is rapidly approaching perfection, and should this be accomplished the adoption of such equipment would bring about a still further reduction in force.

Your committee has no doubt that the institutional efficiency of the telegraph and telephone services in this country would be increased by Government ownership. The statistics in the appendixes hereto show that in the United States compared with other countries the number of telephone calls per employee is relatively low, while the number of mail pieces per employee is relatively high.

The magnitude of the telephone service has led your committee to consider the feasibility of gradually acquiring the network of the country in segments, leaving the remainder to be operated commercially under licenses issued by the Postmaster General. For this purpose the property has been divided into three groups, as follows:

(A) Long-distance and toll lines.
(B) Exchange systems.
(C) Farmer lines.

(A) LONG-DISTANCE AND TOLL LINES.

The long-distance lines of the country are those which form the connection between important cities. They are owned and operated by the American Telegraph & Telephone Co. independently of the associated Bell companies. The failure of the independent companies to secure connection with these lines has been the principal reason for their inability to successfully compete with the Bell companies. This long-distance service was formerly kept quite separate and distinct in some places from the service of the associated Bell compaines, but to-day the wires usually terminate in a separate panel on a main switchboard in the Bell offices.

Few engineering difficulties would be encountered in the acquisition and operation of the long-distance lines as a separate system. They are in excellent condition and are maintained and operated by skilled employees, some of whom it might be advisable for the Government to retain, at least until the consolidation of the post and telephone offices would permit the Postmaster General to make changes and adjustments in the personnel.

The acquisition of only the long-distance lines would necessitate immediate expenditures on the part of the Government to transfer their terminals from the Bell offices to the post offices. In cities where the local commercial telephone companies own the underground conduits it would be practicable and economical for the Government to lease sufficient pairs of wires from the local companies to lead the long-distance lines to the post-office switchboards. The local commercial telephone companies would run wires from their own exchanges to the Government board and thus secure their outlet to neighboring cities.

The toll lines are those centering in city exchanges and running therefrom to near-by towns and villages, to distant suburbs of the cities, and to factories or even residences some distance outside of the local exchange limits. These lines are connected with a separate section of the exchange switchboard. Their acquisition by the Government would be of great value in increasing the efficiency of the long-distance system. No unusual engineering difficulties would be presented in separating these lines from the commercial exchange plant, although they are more closely related to city exchanges than are the long-distance lines.

In some instances it might be difficult to distinguish between a certain toll line in the strict sense of the term and a part of the city exchange system. Therefore, it would be well to designate as "interurban" all long-distance and toll lines, as is done abroad, and include in this class only such lines as really connect cities, towns, or distant communities. This would clearly define the scope of the transfer in the acquisition by the Government of all interurbans.

No trouble should be experienced in the villages and small towns in transferring the toll lines to the Government because the toll telephone is usually the only one in the village and the transfer would simply involve the removal of the instrument and wire from the general store to the post office.

In the community where a struggling little exchange is maintained, serving a few telephones in town and a few on near-by farms, the separation of the toll lines from the existing system would make the town exchange unprofitable and, therefore, the owners would desire to turn it also over to the Government. Provision should be made for the acquisition in such cases of these small exchanges. If the exchanges were not taken over it would be necessary to install switchboards in the post offices and lead the interurban wires thereto on poles. These small switchboards are simple and no great technical knowledge is required to operate them. The operator might perform other duties according to the number of calls per day. The lineman or inspector would keep the lines and equipment in working order and a post-office employee could be easily taught to manipulate the board.

In cities where commercial companies are maintaining remunerative exchanges which involve a large number of instruments, cooperative relations would have to be maintained between the Government and the city exchanges. In such cities the toll lines, like the long-distance lines, would be connected with the post-office switchboards. This may or may not involve underground conduits, according to the municipal regulations.

The superimposing of the telegraph feature on the telephone service (both long-distance and toll) might be gradually brought about at small cost. The long-distance lines of the American Telephone & Telegraph Co. can be, and in some instances actually are, used for telegraphy simultaneously with telephony. There is no reason why the toll lines should not be utilized in the same way. The addition of the telegraph feature to the interurban telephone system of the country would much more than duplicate existing commercial telegraph systems.

(B) EXCHANGE SYSTEMS.

The exchange systems are those which render exclusively local service. In the event it is deemed unwise to take over the telephonic network in its entirety, it is the opinion of your committee that the exchange systems should not be acquired until after the acquisition of the interurban lines. Meanwhile they should be permitted to operate under licenses issued by the Postmaster General.

(C) FARMER LINES.

Farmer lines are certain independent lines built in rural communities by private organizations, mutual associations of farmers, or by individuals for the purpose of connecting the farms with the nearest town or village. These lines involve about 600,000 miles of wire and are owned by about 19,000 different organizations, associations, or individuals. Generally they are not well built or efficiently maintained. In some localities the Bell companies have encouraged farmers to build these lines themselves, permitting them to string the wires on poles, trees, fence posts, etc., and furnishing them with connections with Bell switchboards and toll lines under the condition that they purchase Western Electric equipment. The desirability of the Government's acquiring these lines in their present condition is seriously questioned. It is believed that it would be preferable to license them under regulations prescribed by the Postmaster General.

If it be deemed wise for the Government to take over at the outset only a part of the telephone structure, this should be done with the fixed policy and expressed intention of eventually acquiring the whole commercial network.

There are two clear and sufficient reasons, both from the viewpoint of expediency and desirability, for acquiring the complete network at the outset. Universal extension of service and equitable adjustment of rates can be attained only when the entire service is under one management.

1. A movement toward the acquisition of only a part of the plant—the toll lines, for example—would meet with all the opposition the Bell companies could bring forth, and it would be supported by the strongest possible arguments—the engineering and economic principles referred to. The toll lines and the exchange service are so intimately associated that in many places the same employees serve both. To separate these services would be uneconomical. Furthermore, the separation of the toll and long-distance lines from the exchange service would entail an immediate expenditure for new switchboards, cables, poles, etc.

2. The operation of only a part of the plant is fraught with the obstacles encountered by the British Government when it endeavored to do this. The private companies, realizing that it would be only a question of time when the entire plant would become Government property, would assume an apathetic attitude and allow their plants to run down and become inefficient. Or they might assume a hostile attitude and use every possible means of preventing the efficient conduct of the service in order to discredit the postal management. This attitude could well be assumed even while operating under licenses issued by the Postmaster General.

COST AND PAYMENT.

According to the best available data the capitalization of the long-distance and toll lines represents approximately $200,000,000 and the capitalization of the entire commercial network (exchange service, toll, and long-distance lines) approximately $900,000,000. The cost to the Government would be less than the appraised value, since it would be undesirable for the Government to purchase the real-estate holdings of the telephone companies, such as exchange and office buildings, etc. Sufficient space in these buildings for the exchanges could be leased until accommodations could be provided in the post offices and stations.

While it would be necessary to acquire title and possession of the network by a single process of statutory appropriation, and on the same day, it by no means follows that payment for the properties would or could be made in the same total or single manner. There are altogether some three thousand companies or distinct legal proprietorships of the telephone service. Even the Bell companies, whose holdings comprise approximately three-fourths of the entire network of the country, number more than 200. Therefore, as many distinct payments would be made as there are different proprietorships. Moreover, these payments would extend over a sufficient period in which to make the appraisals and enable the courts to adjust such legal questions as may arise. The payments would be distributed throughout a period of several years, and thus ample time and opportunity to market the bonds would seem to be assured.

It is not believed that any serious difficulty would be encountered in financing the proposition, as the extinction of the securities of the superseded companies by Government acquisition would be likely to create a demand for an equal amount of other securities, and it would be but natural that a large amount of the bonds issued from time to time by the Government would be purchased by the former holders of telephone securities. In this connection attention is directed to the financing of the United States Steel Co., the Panama Canal, and the acquisition of railways by Japan and by Switzerland.

The data assembled by the committee in the course of its investigation, which constituted the basis of its study and conclusions, are set forth in Appendixes A to H, inclusive, that accompany and are hereby made a part of this report.

RECOMMENDATIONS.

Your committee has reached the conclusion that the only way to afford to the people the complete and modern postal facilities that the Constitution makes it the duty of the Government to provide is to put into effect the following recommendations:

1. That Congress declare a Government monopoly over all telegraph, telephone, and radio communication and such other means for the transmission of intelligence as may hereafter develop.
2. That Congress acquire by purchase at this time at appraised value the commercial telephone network, except the farmer lines.
3. That Congress authorize the Postmaster General to issue, in his discretion and under such regulations as he may prescribe, revocable licenses for the operation, by private individuals, associations, companies, and corporations, of the telegraph service and such parts of the telephone service as may not be acquired by the Government.

Respectfully submitted.

Daniel C. Roper.
M. O. Chance,
J. C. Koons,
Committee.

APPENDIXES

TO

GOVERNMENT OWNERSHIP OF ELECTRICAL MEANS OF COMMUNICATION.

REPORT

TO THE

POSTMASTER GENERAL

BY A

SPECIAL COMMITTEE OF THE POST OFFICE DEPARTMENT,

COMPOSED OF

DANIEL C. ROPER, First Assistant Postmaster General.

M. O. CHANCE, Chief Clerk Post Office Department.

J. C. KOONS, Superintendent Division of Salaries and Allowances.

(NOVEMBER 25, 1913.)

APPENDIXES.

The data set forth in these appendixes were secured from the following official publications: Statistique Generale du Service Postal, Journal Telegraphique (et Telephonique), Statistique Generale de la Telephonie, 1896–1910, Tarifs Telephonique, 1905, (all published by the International Postal Union at Berne, Switzerland); Reports of the British Post Office; New Zealand Year Books; Telephone Census, 1902 and 1907 (U. S.); Telegraph Census, 1902 and 1907 (U. S.); Reports of the Post Office Department (U. S.); Bureau of Labor Reports on Telegraph Companies (1909); and on Telephone Companies (1910); Reports of the United States Industrial Commission, 1901; and reports of congressional committees; and from the following unofficial publications: Reports of the Western Union Telegraph Co., the Bell telephone companies, and the American Telephone & Telegraph Co. Reference was had also to the published works of Profs. Holcombe (Harvard), Ely (Wisconsin), Adams (Michigan), and other authorities.

The statistics of the United States are for the year 1912 in the case of the Postal Service, for the years 1907 and 1912 in the case of the telephone service, and for the year 1907 in the case of the telegraph service; all foreign statistics are for the year 1910, except in one instance that is noted.

APPENDIX A.

HISTORICAL RÉSUMÉ OF THE AGITATION FOR GOVERNMENT OWNERSHIP OF THE TELEGRAPH AND TELEPHONE IN THE UNITED STATES.

CONSTITUTIONAL PROVISION FOR POSTAL ESTABLISHMENT.

Congress is empowered by the Constitution "to establish post offices and post roads."

It has been competently decided and long accepted that the power thus delegated to the National Government was that of transmitting intelligence and not merely of employing the then known means of transmitting intelligence. For the exercise of this power the Post Office Department was created. It was at first a small crude office, inadequate for even the primitive needs of the eighteenth century. Mail of all kinds, including letters, was carried by private expresses, and it was not until 1845 that the Government assumed its constitutional monopoly of the transmission of intelligence, by prescribing penalties for the infringement of it.

The Government has not been alert to incorporate in its system new means of administering the service intrusted to it, but has, necessarily perhaps, permitted private enterprise to supplement its service and to blaze the trail into untried fields of usefulness. It is well understood that the powers of the Federal Government, so long as not exercised by it, may be assumed by the States and even by individuals. It is equally well understood that such powers, though long unused by the Federal Government, are never by that circumstance alienated. Vested rights can not possibly be acquired within the field of Federal prerogative.

The Government does not now perform the full postal function assigned to it by the Constitution, though the Post Office Department has grown and developed into an efficient organization with a vast field service reaching everywhere and is fully capable of controlling and operating every known instrumentality for the transmission of intelligence. Two essentially postal agencies, the telegraph and the telephone, are owned and controlled by commercial companies. The private operation of these agencies is a far greater impairment of the postal revenues and a far more serious handicap to the universal and impartial extension of the postal service than was the operation of private expresses for carrying letters and packets against which the legislation of 1845 was effectually directed.

ELECTRO-MAGNETIC TELEGRAPH: 1843.

The electrical discoveries and inventions of Morse and others were first practically applied to the transmission of intelligence by the Government. On March 3, 1843, Congress appropriated $30,000 to test the practicability of the electromagnetic telegraph. A line was stretched under the direction of Prof. Morse between Washington and Baltimore, and on May 24, 1844, communication was opened. Three days later the proceedings of the Democratic convention, sitting at Baltimore, was reported in Washington by means of an instrument installed in the east end of the Capitol.

The Congressional Globe reports the following proceedings in the Senate on June 5, 1844:

> The President pro tempore laid before the Senate a communication from the Treasury Department inclosing Prof. Morse's report of the completion of the electromagnetic telegraph from the city of Washington to the city of Baltimore, as authorized by the act of March 3, 1843. The Secretary of the Treasury *ad interim* in making this communication says: "* * * the perfect practicability of the system has been fully and satisfactorily established by the work already completed. * * *"
>
> The report (that is, by Prof. Morse) details the operation in bringing the experiment to a successful issue, and states * * * that of the $30,000 appropriated by Congress, $3,400 remains unexpended and will probably suffice for current expenses till Congress sees fit to extend the experiment.

POSTAL NATURE OF THE TELEGRAPH.

The postal nature of the telegraph was from the beginning clearly apprehended. In the appropriation act of August 10, 1846, it is provided that "the proceeds of the telegraph between Washington city and Baltimore be, and the same are hereby, directed to be placed in the Treasury of the United States for the benefit of the Post Office Department in the same manner as other revenues from postage."

There were not lacking in that day far-sighted men who clearly saw the significance of the new invention and the political folly of relinquishing Government ownership and control. Henry Clay advocated Government ownership of the telegraph in 1844, saying: "It is quite manifest it is destined to exert great influence on the business affairs of society. In the hands of private individuals they will be able to monopolize intelligence and perform the greatest operations in commerce and other departments of business. I think such an engine should be exclusively under the control of the Government."

REPORT OF POSTMASTER GENERAL JOHNSON: 1845.

The then Postmaster General, Hon. Cave Johnson, in his annual report for the fiscal year 1845 urged that the control of so valuable an agency for the diffusion of intelligence should be left in the hands of the Government, where its operation would be conducted for the benefit of the public. Unfortunately, he was unable to foresee that such operation would ever become a source of revenue rather than of expense, and his pessimism regarding the financial phase of the telegraphic service undoubtedly had much to do with defeating the very recommendation that he urged on the broad ground of public policy. His complete statement on this subject is as follows:

> The electromagnetic telegraph, invented by Prof. Morse, and put in operation between the cities of Washington and Baltimore under appropriations made by Congress, was placed under the superintendence of the Postmaster General by a clause in one of the appropriation acts of the 3d of March last. It had been in use the previous year under the direction of the Secretary of the Treasury, but had been conducted more with reference to the testing of its capabilities and such experiments as tended to perfect and improve its operations. Having been transferred to the Post Office Department, I at once adopted regulations to bring it into constant service as a means of transmitting intelli-

gence accessible to all, and prescribed the rates of postage. The copy of the order, which accompanies this report, marked "No. 11," will show the regulations and the rates of postage adopted. One-half of the rates of postage suggested by Prof. Morse was adopted by me, under the hope that it would greatly increase its revenues. It went into operation on the 1st of April, having expended $680.15 before the charge of postage commenced. From the 1st of April to the 1st of October the expenditures amounted to $3,244.99, making the whole expenditure $3,925.14, whilst the revenues for the six months amounted to the sum of $413.44.

In estimating the expenditures of this line the salary of Prof. Morse, perhaps, ought not to be added. It was fixed by the regulations of the Treasury, and continued in estimates upon which the last appropriation was founded; and his time has been devoted to the general interests and improvements of the telegraph, and a portion of it spent in Europe, where, in his judgment, it could be more sucessfully done than here.

I deem it my duty to bring to your notice the fact that the subject of telegraphic communications, in their fullest extent, as made available by means of this extraordinary invention, is forcing itself upon the attention of the public. The proprietors of the patent securing the exclusive use of the telegraph have, since the last Congress, taken the most active measures to establish lines of communication between the principal cities of the Union. Their success will introduce a means of communicating intelligence amply sufficient for a great variety of purposes and greatly superior in dispatch to those of the public mails, and must secure to itself much of the business that has heretofore been transacted through them, and to that extent diminish the revenues of the department.

It becomes, then, a question of great importance. How far will the Government allow individuals to divide with it the business of transmitting intelligence—an important duty, confided to it by the Constitution, necessarily and properly exclusive? Or will it purchase the telegraph and conduct its operations for the benefit of the public? Experience teaches that if individual enterprise is allowed to perform such portions of the business of the Government as it may find for its advantage, the Government will soon be left to perform unprofitable portions of it only, and must be driven to abandon it entirely or carry it on at a heavy tax upon the Public Treasury. In the hands of individuals or associations the telegraph may become the most potent instrument the world ever knew to effect sudden and large speculations—to rob the many of their just advantages and concentrate them upon the few. If permitted by the Government to be thus held, the public can have no security that it will not be wielded for their injury rather than their benefit. The operation of the telegraph between this city and Baltimore has not satisfied me that under any rate of postages that can be adopted its revenues can be made to equal its expenditures. Its importance to the public does not consist in any probable income that can ever be derived from it; but as an agent vastly superior to any other ever devised by the genius of man for the diffusion of intelligence, which may be accomplished with almost the rapidity of light to any part of the Republic, its value in all commercial transactions, to individuals having the control of it, or to the Government in time of war, could not be estimated. The use of an instrument so powerful for good or for evil can not with safety to the people be left in the hands of private individuals uncontrolled by law.

Order No. 11, to which reference is made by Mr. Johnson, is dated March 29, 1845, and prescribes the salaries of Prof. S. F. B. Morse, superintendent, and his assistants; provides rules for the administration of the service, and that—

For the transmission of each dispatch there shall be paid in advance, at the office from which it is sent by the applicant, one-quarter of 1 cent for each telegraphic character. Upon the reception of a dispatch at either office it shall be the duty of the officers to have the same translated in a fair handwriting, carefully enveloped and sealed, and the magnetic characters immediately destroyed, and to place the dispatch in the hands of the penny post for delivery, who shall be entitled to receive the same compensation therefor as for the delivery of letters transmitted now by mail.

* * * * *

In consideration of the facilities allowed by the railroad company to the superintendent and his assistants in attending to the business of the telegraph, it is further ordered that the free use of the telegraph be conceded to said company for the transmission of communications relating to the business of their road.

PROPOSAL OF PROF. MORSE.

Prof. Morse himself was impressed by the propriety of Government ownership of his invention and offered his patent to the Government for $100,000, saying that it was "an engine for good or evil, which all opinions seem to concur in desiring to have subject to the control of the Government, rather than have it in the hands of private individuals or associations." It is to be regretted that this proposal did not receive favorable consideration at the hands of Congress, but it is to be noted that his own right to the exclusive telegraph idea was disputed by other inventors and was to be the subject of protracted litigation, so that the purchase of his patent did not present to Congress the clear-cut alternative that was to be desired in expending a large amount of Government funds for an intangible idea the value of which was at that time problematical.

CONGRESS AUTHORIZES SALE OF GOVERNMENT TELEGRAPH: 1846.

The telegraph service between Washington and Baltimore was not self-supporting, and appropriations for its maintenance were made but grudgingly by Congress. Every attempt to secure legislation authorizing the building of additional lines failed. On June 19, 1846, the culmination of this short-sighted legislative policy was reached in the act of that date, appropriating—

For defraying the expenses of the magnetic telegraph from the city of Washington to Baltimore, $4,000; this appropriation to be available, if need be, before the commencement of the next fiscal year: *Provided*, That the Postmaster General be, and he is hereby, authorized to let, for a limited time, the aforesaid telegraph to any person who will keep it in operation for its earnings; or he may, under direction of the President of the United States, sell the same.

REPORT OF POSTMASTER GENERAL JOHNSON: 1846.

In his report for the fiscal year ended June 30, 1846, Postmaster General Johnson reiterated his contention for a Government-owned telegraph:

In my last annual communication I brought to your notice this extraordinary invention of Prof. Morse for the transmission of intelligence; its importance in all commercial transactions to those having the control of it; and to the Government itself, particularly in a period of war. I then expressed the opinion that an instrument so powerful for good or for evil could not, with safety to the citizen, be permitted to remain in the hands of individuals uncontrolled by law. Another year's experience gives additional weight to the opinions then expressed.

Telegraphic lines have been established from New York to Boston, Buffalo, Philadelphia, Baltimore, and Washington City; and others are in contemplation from this city south and from Buffalo west, and will be extended to the principal cities of the Union in a few years. It now enables those controlling it to transmit intelligence instantaneously between the different cities where it has been established, and to the important commercial points in the South and West several days in advance of the mails. The evils which the community may suffer, or the benefits which individuals may derive from the possession of such an instrument, under the control of private associations or incorporated companies not controlled by law, can not be overestimated.

I may further add that the department, created under the Constitution and designed to exercise exclusive power for the transmission of intelligence, must necessarily be superseded in much of its most important business in a few years if the telegraph be permitted to remain under the control of individuals. It is the settled conviction of the undersigned that the public interest, as well as the safety of the citizen, requires that the Government should get the exclusive control of it, by purchase, or that its use should be subjected to the restraints of law. Entertaining these opinions, I addressed a letter to the president of the association owning the patent right, to ascertain, as far as practicable, the probable cost if Congress should be inclined to make the purchase. A copy of the reply is herewith communicated, marked "E."

The association is willing to dispose of the right to the Government, but is unwilling to enter into any negotiation upon the subject without authority first given by Congress. I also caused inquiries to be made, from the best sources of information, as to the cost of construction, the expense of keeping up the lines, the profits, and the capability of such lines for the transmission of intelligence. I have received replies, giving minute and detailed statements upon the subjects referred to, which remain on the files of the department for the use of Congress, should they be deemed necessary.

SALE OF THE GOVERNMENT LINE: 1847.

Nothing came of all these recommendations, however, and on March 4, 1847, the Postmaster General, confronted by a depressing condition of the postal finances and despairing of legislative support in prosecuting the enterprise as a part of the Postal Service, effected the sale of the Government line.

This was the period of the Mexican War and of intense political rivalry and sectional controversy. It was also a period of unparalleled expansion. Railroad building and other internal improvement was being prosecuted with dizzy acceleration. The wilderness of the West had become a kaleidoscope of development that was exhilarating and bewildering. In the midst of a host of seemingly greater issues Congress neglected the telegraph.

"WILD-CAT" DEVELOPMENT.

But if the Government was slow to enter into the new enterprise, promotors and speculators eagerly seized upon the opportunity and organized companies for the extension of telegraphic communication. Questionable financial methods and unsubstantial building was characteristic of many of these companies, their object being rather to sell stock than to perform any real service to the public.

RISE OF THE WESTERN UNION AND THE ACT OF 1866.

By 1866 these early "wildcat" concerns had been absorbed by the Western Union Telegraph Co., and an object lesson of the monopolistic tendency of the business was clearly presented. The widespread use during the war of telegraphic lines and equipment by the Signal Corps had shown forcibly the public nature of the utility and the practicability of Government management. In that year Congress enacted the legislation in regard to the telegraph that is still in force:

AN ACT To aid in the construction of telegraph lines, and to secure to the Government the use of the same for postal, military, and other purposes.

Be it enacted by the Senate and the House of Representatives of the United States of America in Congress assembled, That any telegraph company now organized, or which may hereafter be organized under the laws of any State of this Union, shall have the right to construct, maintain, and operate lines of telegraph through and over any portion of the public domain of the United States, over and along any of the military or post roads of the United States which have been or may hereafter be declared such by act of Congress, and over, under, or across the navigable streams or waters of the United States: *Provided,* That such lines of telegraph shall be so constructed and maintained as not to obstruct the navigation of such streams and waters, or interfere with the ordinary travel on such military or post roads. And any of said companies shall have the right to take and use from such public lands the necessary stone, timber, and other materials for its posts, piers, stations, and other needful uses in the construction, maintenance, and operation of said lines of telegraph, and may preempt and use such portion of the unoccupied public lands subject to preemption through which its said lines of telegraph may be located as may be necessary for its stations, not exceeding 40 acres for each station; but such stations shall not be within 15 miles of each other.

SEC. 2. *And be it further enacted,* That telegraphic communications between the several departments of the Government of the United States and their officers and agents shall, in their transmission over the lines of any of said companies, have priority over all other business, and shall be sent at rates to be annually fixed by the Postmaster General.

SEC. 3. *And be it further enacted,* That the rights and privileges hereby granted shall not be transferred by any company acting under this act to any other corporation, association, or person: *Provided, however,* That the United States may at any time after the expiration of five years from the date of the passage of this act, for postal, military, or other purposes, purchase all the telegraph lines, property, and effects of any or all of said companies at an appraised value, to be ascertained by five competent, disinterested persons, two of whom shall be selected by the Postmaster General of the United States, two by the company interested, and one by the four so previously selected.

SEC. 4. *And be it further enacted,* That before any telegraph company shall exercise any of the powers or privileges conferred by this act, such company shall file their written acceptance with the Postmaster General of the restrictions and obligations required by this act.

Approved, July 24, 1866.

REPORT OF POSTMASTER GENERAL RANDALL: 1867.

Postmaster General Randall, in his report for the fiscal year ended June 30, 1867, referred to the fact that the subject of connecting the telegraphic system of the country with the Postal Service had attracted public attention, and that it had recently transpired that the telegraphic system of Great Britain had been put in charge of the British post office department. After stating that it was a matter of very great importance which ought to be thoroughly investigated by Congress, he expressed the opinion that the most efficient mode of examination of the subject would be the appointment of a special commission to inquire into the working of the new arrangement in Great Britain and into its feasibility in the United States and report to Congress.

REPORTS OF POSTMASTER GENERAL CRESWELL: 1869 AND 1871.

In his report for the fiscal year 1869 Postmaster General Creswell referred to the fact that his predecessor (Randall), under date of January 9, 1869, had addressed the Speaker of the House of Representatives in relation to the postal telegraph, inclosing a communication on the subject from Gardiner G. Hubbard, of Boston, and stated that he should defer making any recommendation concerning it until a greater degree of efficiency could be attained in the Postal Service as then constituted.

Mr. Creswell again refers to the subject in his report for the fiscal year ended June 30, 1871, and after discussing the progress of the regulation and control or the ownership and management of telegraph systems in foreign countries, referring particularly to the operation of the system under the Government in Great Britain, which became effective February 5, 1870, he makes the following comment:

> These facts, all tending with overwhelming force in one direction, demonstrate conclusively the utility of the postal telegraph for both Government and people.
>
> Some may hesitate to adopt it in this country because of the great extent of our territory, the paucity of our population in certain large sections, and the great expense involved in extinguishing the rights of telegraph companies. The first two are the same objections that were urged for many years against all ameliorations of our Postal Service; nevertheless postages have been cheapened and made uniform and at the same time the postal system has been maintained and improved. Rightly viewed, the extent of the country is a strong argument in favor of a postal telegraph and the additional facilities and uniform rates it will afford. It is only in countries of large extent that the value of instantaneous or nearly instantaneous communication can be appreciated. Who that desires to convey or acquire any information would hesitate between sending a telegram from New York to California in 7 minutes for 20 cents and sending a letter in 7 days for 3 cents? Our sparse population is rapidly growing more dense by the acquisition of one million and a quarter of people per annum. As railroads are extended across the plains and through the mountains they banish solitude and reclaim the wilderness with a celerity unknown to men of the last generation. The emigrant of to-day moves as part of an organized community. The railroad preserves for him a channel of constant supply, and the telegraph keeps unbroken the communication between the new and the old homestead. Before many years we shall hear complaints, not that we have too much land, but rather that we have not land enough. It is true that a large sum of money will be required for the purchase of the present telegraph lines and their appurtenances. But if this be a difficulty, delay only magnifies it, for, admitting that the Government must at some time become the exclusive proprietor of the telegraphs, it is clear that every year will add to the amount of purchase money it will have to pay. The companies now in existence will extend their operations and new companies will be organized from time to time, all of whom would demand compensation for a surrender of their privileges and property. I therefore deprecate further delay as injurious to the public interests.

MESSAGE OF PRESIDENT GRANT: 1871.

In transmitting to Congress this report of the Postmaster General, President Grant wrote:

> The suggestions of the Postmaster General for improvements in the department presided over by him are earnestly recommended to your special attention; especially do I recommend favorable consideration of

> the plan for uniting the telegraphic system of the United States with the postal system. It is believed that by such a course the cost of telegraphing could be much reduced and the service as well, if not better, rendered. It would secure the further advantage of extending the telegraph through portions of the country where private enterprise will not construct it. Commerce, trade, and, above all, the efforts to bring a people widely separated into a community of interest, are always benefited by a rapid intercommunication.

"WASHBURN" AND "HUBBARD" PLANS BEFORE CONGRESS: 1871-2.

In the meantime the 5-year period stipulated in the act of 1866 had expired and two distinct propositions were being urged in Congress. The first of these, indorsed by the President and the Postmaster General, was originated by Hon. C. C. Washburn, of Wisconsin, and was twice submitted by him in the form of a bill. Mr. Washburn's plan contemplated that the Government should take possession and own the entire telegraph system of the country and operate it as a part of the postal system.

The second proposition was known as the "Hubbard" plan, from its having been originated by Gardiner G. Hubbard, of Boston. The details of this plan were included in December, 1872, in a bill entitled "A bill to connect the telegraph with the Postal Service, and to reduce the rates of correspondence by telegraph." The plan proposed the incorporation of a private company to which should be granted special privileges by the Government, in return for which it should contract with the Post Office Department for the transaction of the telegraphic business of the country at certain specified rates. In other words the plan proposed some such contract relation between this company to be incorporated and the Postal Service as exists between the railroads and the Postal Service.

The division of opinion on the part of those who favored a union of the telegraph with the Postal Service between these two plans of contract and ownership was a source of strength to those who opposed both plans. In a speech in the House of Representatives on January 27, 1872, Congressman Beck said that he believed—

> Gen. Washburn in his report made it clear that the Hubbard scheme would accomplish nothing, while Mr. Palmer, in his report in behalf of that bill, made it clear that the Government's ownership plan is fraught with evil only.

The popular demand for better and cheaper telegraph service had been stimulated by the acquisition in Great Britain in 1870 by the Government of all telegraph lines and the immediate betterment of telegraphic conditions in that country, but for the reason indicated and others no legislation was secured.

REPORT OF POSTMASTER GENERAL CRESWELL: 1872.

In the report of Postmaster General Creswell for the year 1872 he deals at length with the subject of a Government telegraph. His discussion is introduced with a reference to his action in fixing rates for Government messages under authority of law, the protest on the part of the Western Union Telegraph Co., and the subsequent modification of the rates first proposed. Following this he adds—

> Grave difficulties have arisen from time to time between the Government and certain of the telegraph companies, which have declined and still decline to furnish such facilities as are deemed essential to the perfect success of the Signal Service.
>
> In my opinion, a Government telegraph affords the only safeguard against the continuance of such evils. While the embarrassment consequent on the attitude of the telegraph companies toward the Government demand prompt attention, it is but one of the many considerations which point to the adoption of a postal telegraph as a measure of immediate public necessity.
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> When, through the liberality of Congress, the first telegraph line had been constructed and the partial success of the invention demonstrated, the question arose whether the Government should purchase the patent or relinquish to private parties the line which it had built. The reasons why the Government should assume control of this new means of transmitting intelligence were forcibly set forth in various letters of the inventor and in a report of the Ways and Means Committee of the House of Representatives.
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> * * * * *
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> The following paragraph of the report must now be read with peculiar interest:
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> "The committee might easily add to the views and arguments which they have now presented others of a highly commanding character, especially those which relate to the extreme value of which the magnetic telegraph would be in the emergencies of war, and its singular adaptedness to render our system of government easily and certainly maintainable over the immense space from the Atlantic to the Pacific which our territory covers. Doubt has been entertained by many patriotic minds how far the rapid, full, and thorough intercommunication of thought and intelligence so necessary to a people living under a common representative Republic could be expected to take place throughout such immense bounds. That doubt can no longer exist. It has been resolved and put an end to forever by the triumphant success of the electromagnetic telegraph of Prof. Morse, as already tested by the Government."
>
> Owing to the slowness of the public to recognize the advantages of the new invention and the doubts cast on the feasibility of its operation over long distances, the course recommended by the committee was not adopted, and the line, built and for some time maintained at Government expense, was turned over to the holders of the patent. Since that day the above predictions have been gradually approaching realization, and many evils, unforseen by this committee, have grown up under corporate management of the telegraph system.

After comment on the rivalry of the telegraph with the mail, the defects and abuses of the telegraph under corporate management and oppressive tariffs, the report continues—

> But perhaps the greatest evil of the American system in this regard is the utter lack of restraint upon the companies as to their charges. When the "exclusive right," or patent, referred to in the report above quoted, expired it was believed that competition would afford a remedy for the evils which were even then oppressively felt by those who had occasion to use the telegraph. Events, however, have shown this belief to have been unfounded. Although new companies have from time to time sprung up to divide the profits of telegraphy, they have generally proved short lived, and their reductions of tariff have been but temporary and within narrow limits. The vast extent of the lines of the companies now consolidated under the name of the Western Union has enabled them to reduce rates between places reached by the opposition to a point which barely enables the latter to meet expenses without seriously impairing their own revenues. Incredible as it may appear, the official statements of the Western Union Co. show that their average receipt per message has been increased 11 cents, or nearly 20 per cent, since 1867, notwithstanding the undoubted reductions of tariff between important points. Whether this is due to the augmentation of rates between offices not reached by competition or to some other cause I do not know.
>
> Not only has competition thus failed to affect the great mass of the telegraphic business, but in addition there are evidences of a combination between the competing parties which has recently resulted in an advance of rates between points reached by the wires of both. The table (telegraphs, 5) gives a few specimens of rates in operation previous to and since the 1st of May, 1872, which were fixed by agreement between companies formerly rivals. The movement is perfectly natural and from the companies' standpoint justifiable; for it can not be expected that a tariff which is perhaps highly profitable to one company will pay on a divided business the more than doubled expenses of two, even if the capital invested in the opposition system could afford to wait for its dividend until the lines were so extended as to secure a fair share of patronage.

The report then refers to certain abuses of the system, such as the improper use of telegraphic information, free messages, favoritism to customers, and the oppressive influence of telegraph companies upon newspapers. Referring to discussions in Congress upon the subject, the report continues—

> The considerations above noted have long appealed to Congress for the establishment of a postal telegraph. The importance of the measure has been urged from all points of view—by State legislatures, by boards of trade, by commercial conventions, by the independent press, and by private persons, many of whom have been prominently identified with the practical workings of the telegraph in this and other countries. The legislation of Congress, which had previously been confined

> to the liberal encouragement of the telegraph in private hands, was directed after the close of the rebellion toward its assumption by the Government as part of the Post Office Establishment. Strenuous opposition was manifested to this proposal. The reasons alleged against its adoption were principally—
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> 1. That the telegraph was essentially a private interest, and should not be controlled by the Government, especially in a Republic.
> 2. That under our political system a Government telegraph would be a dangerous instrument in the hands of the party in power, increasing its patronage and permitting it to scrutinize and delay the messages of the opposition.
> 3. That Government management, though more expensive, would be less efficient, and that the public would not be so well served thereby.
> 4. That the cost of the postal telegraph would be more than the finances of the country would permit, particularly if, as was claimed, it could not be made self-supporting.
>
> The first three of these objections were not deemed sufficient to counterbalance the advantages which the proposition offered. It was contended, and with effect, that the business of telegraphing was substantially the same as letter carrying, and that no reason could be advanced in favor of governmental management of the one which did not apply with equal force to the other; that the incorporation of the telegraphs with the post office would not at first add largely to the number of officials, and that the technical training and experience which these officials must have in order to perform their duties at all would preclude their selection for political reasons; that the simple precaution of timing the receipt, transmission, and delivery of messages would prevent their delay, and that their secrecy could be as effectually guarded by Government under restraint of law as it ever has been by private parties; that the same motives for efficient management exist on the part of salaried officials, whether in the employ of the Government or of a widely extended corporation; that the people could exert a much greater influence on a Government department, through Congress and through the press, than they can upon a company managed in the interests of its stockholders, notwithstanding the legal responsibility of the latter; that the consolidation of competing lines and the removal of the offices into the post offices would cause a large reduction in the expense of management; and that the employment of one staff for both postal and telegraphic service at perhaps two-thirds of the stations, besides further reducing the expenses, would enable the department to pay better salaries than are now received by either class of employees, and secure greater efficiency. The fourth objection, supported as it was by statistics claiming to show that governmental telegraphs in Europe were not self-supporting, weighed strongly against immediate action on the proposition for a postal telegraph in this country.

Reference is made to the provisions of the telegraph act of 1866, leading up to the following statement:

> The time having now come, in my opinion, when the benefits of a Government telegraph should be secured to the people, it is desirable that advantage should be taken of the provisions of this act and the lines of some or all of the above companies brought under control of this department. The other objections to such a course having, it is believed, been fully answered, it only remains to be shown that the expense of acquiring a comprehensive system of lines can be easily borne, and that the system, once acquired, can be so managed as to realize from the receipts of the telegraph itself sufficient, after meeting all expenses, to pay the interest on the purchase money, provide for all necessary annual extensions, and gradually to recover the principal, even at the greatly reduced rates which prevail in foreign countries. While the limited data at my command will not permit me to give detailed estimates, my information on the subject is sufficiently accurate to enable me to lay before you the following general plan. Before it can be elaborated, it is necessary that I should be authorized to appoint the appraisers provided for in the act of 1866, and, in addition thereto, that a commission should be appointed, to consist of three members, conversant with the subject, to examine the different systems of telegraphy, and to prepare a scheme for submission to Congress with the report of the appraisers.

Mr. Creswell then states his views as to what is involved in the enforcement of the act of 1866, including the desirability and possibility of increasing telegraphic facilities, the possibility of a reduction in rates, the probable increase in business, the estimated revenue and expenditures, and the necessity of a Government telegraph in time of war. He then discusses the proposed incorporation of "The Postal Telegraph Co.," presenting objections to the plan proposed, which contemplates the establishment of a telegraph company to work its lines in connection with the Post Office Department.

REPORT OF POSTMASTER GENERAL CRESWELL: 1873.

Postmaster General Creswell, in his report for the year 1873, again reiterates his views on a postal telegraph, which are summed up in the following paragraph:

> The necessity for an efficient and cheap mode of telegraphic communication, which shall be beyond the control of private monopolies, and within the means of all, is daily becoming more apparent. Under the present management the use of the telegraph by the masses of the people is almost probibited, by reason of arbitrary rates, unnecessarily high charges, and a want of facilities. This assertion is verified by the testimony of the president of the Western Union Co., who stated before a committee of Congress that, out of 40,000,000 of our population, only 1,000,000 use the telegraph at all. This is certainly an anomalous condition of affairs among a people the first in the world for intelligence and business activity. It may, however, be regarded as settled that, while under the control of private companies, whose chief object is to make a profit for their stockholders, and whose skill and labor are expended in efforts to advance the prices of their stock, and to enforce the highest rates to which the public can be made to submit, the telegraph will never become a general medium of correspondence. A Government postal telegraph is the only means by which the full advantage of this great invention can be secured; for, wherever the telegraph is under Government management, it is operated at its minimum cost, and the people receive the benefit in low rates of transmission and in greatly extended facilities.

He then discusses at some length the development of the telegraph and the possibilities of its development, and takes the position that there are but two parties to the controversy, "on one side the people, on the other the Western Union Telegraph Co.," and quotes the following from a report of the president of the Western Union Co., dated October 8, 1873:

> The scale of rates fixed by competition on the most important routes and between the principal cities has been applied recently to the whole country east of the Rocky Mountains, so that the inducement to subscribe capital for the extension of competing lines in order to secure the benefit of competing rates no longer exists. At the rates now established it is impossible for any competing company to realize profits, and some of them are known to be, and all are believed to be, operating at a loss. As a result, the extension of competing lines has ceased, and it is not believed that capital can be found wherewith to inaugurate new enterprises in any quarter. The time is not distant, therefore, when the Western Union Co. will be without a substantial competitor in the conduct of a business which, notwithstanding the enormous growth of the last seven years, still is in its infancy. With the increase of lines already provided and now in progress, the capacity of which the duplex apparatus hereinbefore spoken of will be able to double at small cost, it is believed that the constantly increasing volume of business, the growth of which will be stimulated by the present low and uniform rates, can be successfully handled with a less annual investment in new construction than has heretofore been necessary; so that with competition checked and in process of being extinguished, the percentage of expenses may be reduced, and the patience of the stockholders be rewarded at an early day by the resumption of regular dividends.

After discussing the policy of the company, referring particularly to the frank statement of the president that the judicious use of complimentary franks among national, State, and municipal authorities has been the means of saving to the company many times the money value of the free service performed, Mr. Creswell concludes with the following:

> The telegraph should be made a part of the postal system without further delay. As Congress does not seem inclined to exercise the discretion given in the third section of the act of July 24, 1866, to appoint appraisers to value the "lines, property, and effects" of the companies now in operation, and as the Western Union Co. appears to be unwilling to make a voluntary sale at a fair price, I recommend that provision be made by law for the immediate establishment of the postal telegraph, and for the construction of all such lines as may be needed, under the direction of competent officers of the Engineer Corps of the Army. The experience they acquired during the War of the Rebellion would enable them to do the work in the most economical and satisfactory manner.

REPORT OF POSTMASTER GENERAL MAYNARD: 1880.

The matter of Government control of the telegraph system of the country does not appear to have been again discussed in reports of the department until the report of Postmaster General Maynard for the year 1880. He refers to a visit to the British post office and to the success of the operation of the telegraph system by the postal service of that country, and inquires—

Is it not time for us to renew the inquiry whether it is wise to leave this important instrument of correspondence in charge of corporations whose primary object is gain to the managers and stockholders, and the convenience of the public secondary only?

REPORT OF POSTMASTER-GENERAL HOWE: 1882.

In the report of the department for the fiscal year ended June 30, 1882, Mr. Maynard's successor, Mr. Howe, refers to the consideration which was given in the past to the question by Postmasters General and committees of Congress, who have urged that the Post Office Department should take exclusive possession of the telegraph service, and states that he is forced to the conclusion "that the time has fully come" when the telegraph and postal service should be embraced under one management. In summarizing the arguments presented he states, among other things, the following:

The business of the telegraph is inherently the same as that of the mail. It is to transmit messages from one person to another. That is the very purpose for which post offices and post roads are established. The power to establish is not limited to any particular modes of transmission. The telegraph was not known when the Constitution was adopted. Neither was the railway. I can not doubt that the power to employ one is as clear as to employ the other.

If the union of the two services did not improve that of the telegraph at all, I think it would improve the postal service in some important respects. It would necessitate the employment of telegraph operators for postmasters in many offices. That would result in giving to the administration of not a few offices men who have learned to do one thing in place of those who have never learned to do anything. If the two offices were united, whenever a mail did not arrive on time the public thronging the post office would learn, not merely that the mail had not arrived, but when it would arrive.

* * * * *

But a union of the two services would, I believe, improve the telegraph more than it would the postal service.

I prefer no accusation against the administration of the former service. Admitting it to be honest and efficient, the fact remains that it is not cheap, and under corporate control it can not be cheap. Rent for both services would cost but little more than the cost for one. So of fuel and of light. Where there is now a free delivery of mail, telegraph messages could be delivered at less cost by the post office than by a corporation. Besides, if the business was controlled by the Government there would be but a single management for the whole. The business is now charged with the cost of many different managements. One direction is cheaper than several.

Mr. Howe refers to the evil possibilities of continuance of the control of this facility by private interests, which would not exist if under Government control, and concludes with the following:

It may be objected, and has been, that the measure proposed would largely extend the roll of Federal officials. That increase has doubtless been exaggerated. At a very large percentage of the offices the telegraph operator would not supplement the postmaster, but would supplant him. Besides, I know of no law but necessity limiting the employment of officials. The Government is not wise which employs a single officer not needed. It is unwise if it refuses to employ thousands when they are needed.

Within the life of this generation this Government employed more than 2,500,000 officers. They were all armed. They did not destroy the country; they saved it. It is not difficult to find individuals who employ 1,000 men and find profit in it. It does not become 50,000,000 to shrink from employing 100,000 if they have need for their services.

REPORT OF POSTMASTER GENERAL GRESHAM: 1883.

The discussion of this subject by Postmaster General W. Q. Gresham, in his report for the year ending June 30, 1883, is particularly interesting because he presents the legal phases of the subject and concludes that Congress has the constitutional power to assume control of the telegraph, either by the acquisition and operation of the existing lines or the construction of lines which would operate in competition with existing companies. The salient portions of his discussion are as follows:

The subject of telegraphy in connection with our postal system is one of special and increasing interest. It has in all its aspects and relations been so fully discussed in the reports of this department, as well as in Congress and by the press, as to obviate the necessity of an elaborate presentation of it in this report. I may, however, remark that the impression widely prevails that our means of telegraphic communication should not be limited to such as are furnished by private companies which enjoy a monopoly and claim to be exempt from Government control in their relations with the public. Several substitutes for the present system have been suggested: (1) The acquisition and operation of the existing lines by the Government. (2) The construction by the Government of lines which it will operate in competition with existing companies. * * * (The portion omitted relates to a plan for the creation of a company which will supply lines of telegraph to be operated by the Government.) * * *

I merely state in the most general form the leading features of each of these plans. It will be perceived that they are essentially different. The first two contemplate that the Government shall own and operate the lines, including all the necessary apparatus; and the third that a company shall be employed to perform the required service at a stipulated compensation.

The Constitution confers upon Congress the power to "establish post offices and post roads," "to regulate commerce among the several States," and "to make all laws which shall be necessary and proper for carrying into execution" the expressly granted powers.

The question arises whether, under such comprehensive terms, the proposed changes in the postal system are warranted by the Constitution. So far as the clause relating to post offices and post roads is concerned, the subject has received careful consideration by committees of the House of Representatives. In speaking of the modes of transmitting intelligence which have been introduced since the adoption of the Constitution, the Committee on Ways and Means, in a report submitted to the House more than 40 years ago, makes the following just remarks:

"But though not anticipated or foreseen, these new and improved modes were as clearly within the purview of the Constitution as were the older and less perfect ones with which our ancestors were familiar. * * *

"The same principle which justified and demanded the transference of the mail on many chief routes from the horse-drawn coach on common highways to steam-impelled vehicles on land and water is equally potent to warrant the calling of the electromagnetic telegraph in aid of the post office in discharge of its great function of rapidly transmitting correspondence and intelligence."

The Committee on the Judiciary of the House in 1875, in an elaborate report in which the constitutional provision is discussed with marked ability, reached the same conclusion.

Our court of last resort, in Pensacola Telegraph Co. *v.* Western Union Telegraph Co. (96 U. S., 1, 9), holds as follows: "The powers thus granted are not confined to the instrumentalities of commerce or the postal service known or in use when the Constitution was adopted, but they keep pace with the progress of the country, and adapt themselves to the new developments of time and circumstances. They extend from the horse with its rider to the stage coach, from the sailing vessel to the steamboat, from the coach and the steamboat to the railroad, and from the railroad to the telegraph, as these new agencies are successively brought into use to meet the demands of increasing population and wealth. They were intended for the government of the business to which they relate, at all times and under all circumstances. As they were intrusted to the General Government for the good of the nation, it is not only the right but the duty of Congress to see to it that intercourse among the States and the transmission of intelligence are not obstructed or unnecessarily encumbered by State legislation."

From the best consideration which I have been enabled to bestow upon the subject, I have reached the conclusion that Congress has the constitutional power in providing for the Postal Service of the country to avail itself of all the facilities devised by the inventive genius of modern times for transmitting messages and intelligence, and that it has full authority to adopt either of the first two plans which I have mentioned.

The third section of the act of July 24, 1866 (14 Stat., 22), secured to the United States, at any time after the expiration of five years from that date, the right to purchase at an appraised value "the lines, property, and effects" of any or all the companies which, in the mode prescribed, availed themselves of the benefit and privileges conferred by the act. All the leading companies have accepted the act. Independently, however, of its provisions, the United States Government, by the exercise of its right of eminent domain, has the undoubted authority to appropriate property within the respective States for its own uses and to enable it to perform its proper functions. "Such an authority," says the Supreme Court, in Kohl *v.* United States (91 U. S.,

> 367, 371), "is essential to its independent existence and perpetuity." In whatever mode the existing lines be acquired, full compensation for them must be made.
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> From the earliest period it has been assumed, and in later times judicially determined, that the power of Congress over the postal system extends to the absolute prohibition of the business of carrying letters upon established post roads or roads parallel thereto. It, therefore, follows that if the telegraph be adopted as a branch of the postal service, all competition therewith may be prohibited.
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> The commerce clause of the Constitution, so far as it bears upon this question, remains to be considered. It has been determined by the Supreme Court that the telegraph is an instrument of commerce, and as such is subject to the regulating power of Congress. "A telegraph company," says the court in Telegraph Co. *v.* Texas (105 U. S., 460, 464), "occupies the same relation to commerce as a carrier of messages that a railroad company does as a carrier of goods. Both companies are instruments of commerce, and their business is commerce itself. They do their transportation in different ways, and their liabilities are in some respects different, but they are both indispensable to those engaged to any considerable extent in commercial pursuits." That clause does not, however, authorize the regulation of the business of transmitting messages by telegraph between points wholly within a State.
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> The establishment and operation of a postal telegraph as a monopoly or in competition with private companies would, it is insisted, reduce rates which are now exorbitant and protect the public against the abuses and evils deemed to be inseparable from the service as it exists. In either event an enormous expense must be incurred. But without dwelling upon that consideration, it is clear that an efficient execution of either plan will necessarily involve the employment of a multitude of operators, messengers, mechanics, and laborers, and thus largely add to the patronage of the Government. An increase of that patronage beyond what is indispensable to the public service is to be deprecated and avoided, and it is one of the dangers which threaten the purity and duration of our institutions. In Europe the telegraph is under the control of the public authorities. With us the administration is the Government in action, and may, for the time being and for all practical purposes, be considered the Government itself. In seasons of political excitement, and to some extent at other times, is there not ground for serious apprehension that the telegraph, under the exclusive control of the dominant party, might be abused to promote partisan purposes and perpetuate the power of the administration? But if it could be kept entirely free from such influence, I should hesitate to sanction a measure providing that the United States shall become the proprietor of telegraph lines, and operate them by its officers and agents.
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> As to telegraphic service wholly within the several States, unless the power to establish post offices and post roads be successfully invoked, the existing rates are beyond governmental control. The opinion has been advanced that inasmuch as Congress has authority to take charge of the telegraph as a part of the postal system, it may do nothing in that direction and yet prohibit citizens and private companies from engaging in the business, unless they comply with prescribed terms and conditions. It is said that the greater power necessarily includes the less; or, in other words, that the absolute power to prohibit includes the limited power to regulate. This doctrine has evidently no application. It is only by exercising the power in some of the modes already discussed, or in some other appropriate way, that the Government can prescribe terms upon which competition will be permitted or prohibit it altogether. When a line is neither owned, controlled, or operated by the Government, nor in its behalf, a telegraph company in the transaction of so much of its business as is confined within the limits of a State is beyond the reach of Congress.
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> I have endeavored to maintain the authority of Congress to assume control of the telegraph because it has been and still is seriously disputed. The existing companies operate their lines solely for the purpose of making money, and while it is doubtless true that their rates, as a whole, are unreasonable, yet in view of what has already been said, I do not think the evils complained of are so grievous as to call for congressional intervention.

BILL AND ARGUMENTS OF SENATOR HILL IN UNITED STATES SENATE: 1884.

One of many bills introduced from time to time in Congress in the attempt to overcome the legislative inertia on the subject of postal telegraph was that presented on January 14, 1884, by Senator Hill of Colorado. Senator Hill's bill provided for the establishment of a system of postal telegraphs in the United States, and in supporting it he said that Governments everywhere had undertaken the management of the telegraph business and that—

> In performing it they mainly act as agents of society, for the promotion of its happiness and prosperity, and not for their own aggrandizement. Even the direct raising of revenue is no longer a prime object, but only an incident of the service. The limits of political boundaries which confine the other functions of government have been by mutual consent broken over by the postal system, and it is now operating as a mighty force to bind together in amity the nations of the world. Upon Governments considered as mere instruments for the preservation of the peace the effect of cheap and frequent postal communication has been to bring the people into closer relation, thus diminishing the chances of foreign and domestic troubles, and to make more easy the maintenance of their ordinary powers by stimulating and giving greater play to the productive forces from which the revenues to support these powers must be provided.

He pointed his opinion that Government supervision of the telegraph would result in great benefits by a reference to the enormous increase in the postal business in this country and in Great Britain after a reduction in the rate of postage and the consequent quickening of commerce and business as well as the brightening of the ties of social life.

The Senator stated that the direction of the first system of postal communication in this country was assumed by the Continental Congress in ordinances which declared its functions to be "the communicating intelligence with regularity and dispatch from one part to another of these United States." And by the Articles of Confederation the power of "establishing and regulating post offices from one State to another" was expressly committed to Congress. Although post roads were not mentioned in the Articles of Confederation, the power to establish them was necessarily presumed, and by the act of October 18, 1782, an extended system of postal communication was put in operation. In the first draft of the Constitution there was a clause "Congress shall have power to establish post offices," but the words "and post roads" were added by a vote of the majority of the State delegations, and the amendment was afterwards unanimously concurred in. In the first permanent act of Congress "to establish post offices and post roads within the United States," passed February 20, 1792, provision was made for the Postal Service "in packet boats or vessels passing by sea to and from the United States or from one point to another therein." The act of February 27, 1813, authorized the Postmaster General "to contract for carrying the mails of the United States in any steamboat or boats which are or may be established to ply between one post town and another post town." Penalties for the nondelivery of the mails within a certain time by persons employed on such boats were provided by the act of February 27, 1815, and by the act of March 23, 1823, it was enacted—

> That all waters on which steamboats regularly pass from port to port shall be considered and established as post roads, subject to the provisions contained in the several acts regulating the Post Office Establishment.

Senator Hill cited various other acts as evidence of the power of the Government to designate different methods of transportation as post roads.

In connection with the effort of the Government to acquire land in Cincinnati, Ohio, for the erection of a Federal building, the Supreme Court, to whom the matter was brought, ruled—

> When the power to establish post offices and to create courts within the States was conferred upon the Federal Government, included in it was authority to obtain sites for such offices and for courthouses, and to obtain them by such means as were known and appropriate. The right of eminent domain was one of these means well known when the Constitution was adopted and employed to obtain lands for public uses. Its existence, therefore, in the grantee of that power ought not to be questioned. (Kohl *v.* The United States, 91 U. S. R., 372.)

Senator Hill claimed that under this ruling there was no doubt that the courts would hold that the Government could acquire lands in the respective States to enable it to establish post roads in the States, even if it should be decided to designate telegraph lines as post roads. He stated that a reduction of telegraph rates under Government ownership would prove of inestimable value to the great mass of people who are unable to take advantage of it at present, due to the high rates charged. He called attention to the fact that if there was such a large increase in business in most of the foreign countries (where the distances are short) upon a reduction in rates, the amount of business in this country would be proportionately larger, due to the greater distances and the consequent saving in time by the use of the telegraph.

REPEATED ATTEMPTS TO SECURE LEGISLATION.

The attempt of Senator Hill to secure the desired legislation was unsuccessful, as have been some two dozen similar attempts since 1871. At least three-fourths of these bills have been favorably reported on by House and Senate committees.

REPORT OF POSTMASTER GENERAL WANAMAKER: 1889.

In 1889 Postmaster General Wanamaker, in reporting on an effort to secure reduced telegraph rates for the Government, says:

> At the same time the Postmaster General sought consideration, first, for an exceptional rate for the department messages believed to be warranted by the rates to others and the assistance rendered by the Government to the telegraph companies under the act of 1866; and second (incidentally and not connected with the subject of fixing rates), he endeavored to obtain consideration for a proposition to establish, not for Government business but for the people at large, a limited service at lower rates, using the post offices, stations, and ordinary deliveries of the post offices, according to a plan to be prepared for submission to the Fifty-first Congress. The idea was to connect the telegraph wires with all the free-delivery offices and to take messages at or about one-half the current rates, delivering by letter carriers by regular deliveries.
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> With no other liability for telegraphic messages than that for the ordinary mail; with no necessity for booking messages, or auditing and keeping cash accounts; by using postage stamps in payment as for letter postage, the cost of the service would be reduced and the rate could be fairly reduced on telegraphic messages. The delivery of such telegraphic messages in another city on the day they originated seemed to me to offer an accommodation that vast numbers of people would avail themselves of, especially for communications of a social and family nature, if the service could be performed at lower rates. The equipment of the post offices seemed to be all ready to do this cheaper service.
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> The negotiations were not fruitful, except in a general public discussion of the subject of telegraphy.

Mr. Wanamaker then states how he arrived at the rates fixed and submits correspondence with the telegraph companies which contains valuable information applying to conditions existing at that time. Continuing his report, Mr. Wanamaker says:

> I confess to a disappointment in that the negotiations with the Western Union Telegraph Co. did not lead to a scheme which I hoped to submit with this report for your approval, whereby the people at large could have the benefit of telegraphic service at popular rates. It is stated that merchants, bankers, and newspapers are now the principal customers of the telegraph companies in this country. The statistics of the telegraphic system of continental countries show that a large proportion of the customers (50 per cent is stated by some persons) are family and social messages, and not from business sources. With a lower telegraphic rate and with stations at the windows of the post office, to which ladies are accustomed, an entirely new class of business would grow up, affording great convenience to many not now in the habit of using the wires. The telegraph is defined to be "an instrument for conveying intelligence beyond the limits of distance at which the voice is audible." This definition would apply equally to the post office, and is in fact the object for which the post office was established.
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> The great propriety and advantage of a united service can not be questioned from a point of convenience and economy to the people. There is no reason whatever why the night messages of the telegraph companies should not be delivered as postal matter by the first morning delivery of the carriers. This is proper post-office business, and would add to the profits of the department. The vast network of wires covering the country could easily reach many of the village post offices and benefit more people than by stopping at the railroad stations, which are often a mile or more distant from where the people live. An experiment could be easily and quickly made to ascertain whether the demand for cheaper telegraphic service exists as is claimed. It could be done without any outlay of money by the Government, and with no interference with existing telegraph interests, inasmuch as it would create, as stated, a new class of business. Moreover, many people becoming acquainted with the uses of the telegraph would wonder how they ever managed to get along without it, and would find themselves using the swifter service as well as the limited, and financially guaranteed messages would continue to be confined to and carried by the existing corporations.
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> A contract should be made with telegraph lines now in operation or that may be hereafter built, under advertisement and public bid, at the most favorable rate that can be obtained in the same manner as the Post Office Department now contracts with railroad companies for the carrying of letters and postal cards, connecting the wires with free delivery and other designated post offices, and receiving messages to be delivered in each instance at the next carrier delivery after their receipt in the city to which they are sent. Some of the free-delivery offices deliver mail ten times a day, some six, and few less than four. A Washington message to New York or Boston, announcing that the sender is leaving by train and is to be met at the station, or any kind of message which will be in season if delivered the day of starting. would fall into one of several regular deliveries at the office connected by telegraph in the other city. The slower service would answer all purposes for numbers of people. No additional expense is required for office or clerk hire. One expert telegrapher could be selected when the postal clerks are appointed. If there was sufficient telegraphic business wholly to employ one man's time, so much the better. A clerk could be assigned for this particular work and the service would be that much more likely to be profitable. Repeating the fact of no other responsibility in this limited telegraph bureau than that for ordinary mail; no expensive system of copying and recording by using postage stamps for payments; no cash accounting needed—the low expenses would justify low rates for the people's benefit. It is believed that a rate of 1 cent a word would make a self-sustaining service and in a short time be a source of profit. If each money-order office sent but three messages per day there would be 27,000 messages, which would be a good business. Connecting the money-order offices by wire, payments of money could be telegraphed by private code to various points free, or at a trifling cost, and add to the convenience of many people.
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> I respectfully ask that such legislation be enacted as is necessary to empower the Postmaster General to enter into contract with responsible parties for a term not exceeding five years, with a privilege of renewal, on conditions favorable to the Government, for the purpose of establishing a limited post and telegraph service.

REPORT OF POSTMASTER GENERAL WANAMAKER: 1890.

In 1890, Mr. Wanamaker again urges the control of the telegraph by the Post Office Department through contracting with telegraph companies to furnish lines, instruments, and operators, and to transmit messages at rates fixed by the Government, all of which would go to the contracting company except 2 cents per message, which would be retained by the Post Office Department to cover the expense of collecting and distributing. He argues that the people have the right to the use of the plant of the Postal Service as a means of reducing the cost of telegraphic correspondence and for the instant transmission of postal money orders, and in answer to certain objections to Government control of the telegraph, says—

> Certain limited classes are against this consolidation, but the masses of the people are strongly for it. It is not possible to take an accurate census of those favoring or opposing it, but any disinterested person may discover the trend of feeling that has set in. That man must be willfully blind who does not see the vast and rising tide of public sentiment against monopoly. Here is a purpose of the people, and no man or set of men can turn it aside. In one form or another the public imperatively demands cheaper telegraphy, and the Post Office Department can supply it at less cost than any corporation, unless the latter has rent, light, and fuel free, and carriers and clerks without pay. ,It has been argued that it is not the business of the Government to operate

the telegraph, but the Government of this and every other country controls the mail service and stoutly claims that the general welfare is promoted by managing the transmission of correspondence. In pursuing that object it puts on mails at great cost, cheapens postage, and constantly adds facilities for ready communication. The general welfare will be similarly promoted by going one step further and giving the quickest of all modes of communication, namely, cheap telegraphic facilities, as it does mails, at points not profitable for private capital to reach, as well as at all other points. If mails were only run to self-sustaining or profit-making points, the extent of the service would be cut off 40 per cent. The postal system is not a scheme for profit. If it were, newspapers and books would pay their proportionate cost and either a large annual surplus would appear in these reports or the free delivery would be extended universally. The Postal Service is the Government's kind hand, protecting and promoting the correspondence of its people, and communication by telegraph as well as by mail is essential to its best development.

An objection urged by the above-referred-to class of persons against the assumption of any telegraph business by the Government is that the telegraph would be in the hands of the party in power and liable to corrupt use in times of political excitement. This is more specious than sound. The Postal Service is in the hands of the party in power and liable to the same abuse. Stringent laws and penalties hedge around the postal system, jealous eyes watch it, and it is ever open to public observation and inquiry. The telegraph business, in the hands of private individuals, is not so hedged about and it is much more likely to be used for corrupt purposes.

Another specious objection is that the Government ought not to compete with existing companies. But the people have rights and interests as well as the telegraph companies. In 1866 it was proposed to assume control of the telegraph lines; but it was then held by these companies that they should be permitted to realize some profit on their investments, and by act of Congress five years were allowed for that purpose, since which time the people have paid rates (in many cases and at many points excessive) that have earned over $100,000,000, which has been divided among stockholders or added to telegraph plants. The companies have been permitted to enjoy these valuable franchises for a quarter of a century instead of five years. Even now it is not proposed to take these properties out of the hands of their owners, but to open to them and to the public the privilege of bidding for telegraph service on a modified scale, which will not, it is practically certain, interfere with the service now existing.

It is sometimes maintained that the telegraphic service can be performed more cheaply by private hands. If this objection is good, it holds against all kinds of Government work. The public revenue ought to be collected by private hands. The laws ought to be administered by contracting parties. A banking firm ought to manage the Treasury, and the postal business should be handled by a syndicate. The question is, What is the best and safest for the public interest, as well as what can the general public afford to use? No one believes that the mail service would have been so widely extended by any private corporation that had to pay dividends to its stockholders. One-cent postage would never come if the post-office business were in the hands of a money-making corporation. It is for the interest of a private company to extend its business only so fast and so far as it is profitable; it is the aim of the Government to extend its service wherever it is actually needed. These further objections are made: Large outlays of money and an increase of Government patronage. Both fall to the ground, because, under the plan proposed, it is not intended to buy or build telegraph lines, but to contract with existing companies, or such as may hereafter be established; and such contracts would provide not only telegraphic lines, but instruments and clerks to operate them, except at small offices, where the postmaster or one of his clerks would also be paid by the telegraph company to act as operator. Therefore, there could be no drafts on the Treasury or additions to the civil list, except as the general service grew, and it is growing every day now. The contracting telegraph company would furnish lines, instruments, and operators, and transmit the messages at rates fixed by the Government, all of which would go to the company except 2 cents per message, which would be retained by the Post Office Department to cover its expense in collecting and distributing.

In brief, this is the plan proposed. There would be no outlay of money, no appointments of clerks, and no financial liability. The persistent misstatement of the facts at the outset led to some misunderstandings on the part of a small portion of the public. The actual plan is surely etnitled to a just statement and a fair consideration. If there is a better one it will be quickly discovered and adopted. Many boards of trade, chambers of commerce, and trade and labor organizations throughout the country have, during the past year, passed resolutions demanding postal telegraph in this or some other form. The subject was considered by the Committee on the Post Office and Post Roads of the House, but was not acted upon beyond granting hearings to the parties interested. The Committee on Post Offices and Post Roads of the Senate reported the bill unanimously.

A few facts from the last official report of the postmaster general of Great Britian, dated August 11, 1890, controvert the somewhat accepted opinion that the English system of postal telegraphy is a great expense to the Government and a failure. The increase in the number of inland and foreign telegrams was 8.5 and 8.1, respectively. The number of telegrams on the business of railway companies, transmitted without charge by the post office under obligations incurred when the use of their system was acquired by the Government, increased nearly 17 per cent. Press telegrams are transmitted at very low rates and at considerable loss to the revenue. In spite of this free and losing business, however, the English postal telegraph was practically self-supporting in 1887–88, showed a large profit in 1888–89, and cleared over $500,000 in 1889–90. This, to be sure, is making no charge for interest on the outlay; but it may be answered that the full interest on the cost of the plant can not be fairly charged to the expense account, because, as is universally admitted, the Government paid an excessively high price for the old telegraph lines.

The relation of the receipts and expenditures of the English system during the past three years is given in the following table:

Year.	Receipts.	Expenditures.
1887–88	£1,992,949	£1,999,033
1888–89	2,129,965	2,041,361
1889–90	2,363,836	2,262,310

It is to be observed that the business of the English newspapers, as well as the foreign, railway, Government, and ordinary business, was done, and done acceptably, though at a loss to the revenue; and it may be repeated that this real Government telegraph system, in spite of its large free and undercost business, pays its way, leaving a gradually increasing surplus to be applied to interest account on the investment, which is unusual in Government works. The telegraph scheme which I advocate could never fail to pay its way from beginning to end, because the very fact that a postal-telegraph stamp had been put upon a telegram would imply that the expense of collecting, transmitting, and delivering the telegram had been paid in advance. The limited plan, in other words, collects as it goes for exactly what it does. To draw another parallel from the English system, which is necessarily not so free from the red tape of Government control as the contract scheme would be in this country, it may be pointed out that the general telegraph business, whether commercial, social, or press, could be handled more expeditiously than under the present entirely private system, because the delay in accounting would disappear with the advent of the postal-telegraph stamp.

REPORT OF POSTMASTER GENERAL WANAMAKER: 1891.

Taking up this subject again in 1891, Mr. Wanamaker urges Government control of the telephone system, as well as the telegraph system, and deals particularly with reference to the objection that such course is unconstitutional:

The Federal Constitution declares that Congress shall have power to establish post offices and post roads. (Const. U. S., art. 1, sec 8.) The general interpretation of this has been that it not only confers the power but makes it a duty, to establish a suitable and efficient postal service throughout the country, and while it holds a monopoly of the postal service it is bound to adopt all the means that invention and experience have discovered to transmit intelligence between the people. The Hon. Walter Clark, associate justice of the supreme court of North Carolina, in an admirable paper addressed to me some time ago on this subject, to which I am indebted for several suggestions or quotations that follow, says in substance that nothing in this clause of the Constitution restricts Congress to the use of particular methods.

The framers of the Constitution, when they instituted the Postal Service, probably never dreamed of postage stamps, registered letters, free delivery, railway post-office cars, canceling machines, and the modern conveniences in use to-day to dispatch the mails. All details were left succeeding generations to work out according to the needs of the times. Who could suppose that mails in this age might go entirely upon horseback or by coach, as they did 100 years ago? The man who attempted to manage a large business to-day by the old methods would be bankrupt in a short time. Sir Rowland Hill proved in England that cheaper and uniform postage was feasible. Thereafter similar measures were approved by Congress for this country. Steam came into use as a motive power, and Congress quickly ordered it to be employed as an agency of the Postal Service. Every other improvement that appears is favorably considered and applied if practical to the postal work.

The one potent agency and the only one that remains beyond our reach is electricity. Its practical value has been known for half a century, but the department stands in relation to it where it stood 50 years ago. The business of the entire world is to-day so dependent upon electricity that its withdrawal would seriously affect almost every interest that exists; yet the chief servant of all the people, the post office, which by its equipment is able to make the largest and most beneficent use of it, is so limited in its authority that it can only adopt the slower methods and a man out of money in San Francisco must stop six days and pay $10 board while he waits on the mail to bring a $20 money order from New York. The reason is known to all men.

To say that Congress has refused to sanction its use in the Postal Service because such an act would be unconstitutional is not true. From many pages of legal authorities the contrary appears. The clause of the Constitution is understood to be mandatory upon the National Government to provide a postal service, since in the face of that provision neither of the States, corporations, or private conpanies may do so. Therefore, it might be more truly said that it is unconstitutional for the Government not to adopt, in the fulfillment of its duty to the people, the best modes of transmitting correspondence that appear in each age.

The first telegraph was operated by the Post Office Department, and it was an evil hour for the people when, against the protest of the Postmaster General, it was surrendered. I want to see the two great servants for the people—the post office and the telegraph—reunited, and the telephone brought in to enhance the value of the combination. Public interests, private needs, and the popular will call for these agencies to perfect the great postal system of this country. The longer their employment is delayed the greater the aggravation and injustice to the people, and the costlier it will be to secure them. Sixty-four million of people are taxing themselves to-day, and to the amount of $70,000,000 annually, to maintain the post-office plant, and are denied the right to vitalize this magnificent machinery with the mightiest force which science has given to render that machinery most effective.

It is a surprise to other great nations that America should lag behind in a form of enterprise that is no longer an experiment, and a cause of remark that the people do not rise up to demand cheaper telegraph, through the convenience and economies of the Post Office Department. Great Britain and Ireland enjoy a rate, uniform like postage, of sixpence for 12 words to any distance. Germany has about the same rate, and in Austria the rate is lower. In France and Belgium the rate is under 10 cents (half a franc) for 10 words, between any two points; and at these rates it is said the telegraph is a profitable adjunct to the postal system.

Is it creditable to our statesmanship to support the postal system at such large expense and fail to use it at its full capacity when other nations have utilized this agency for the benefit of the people with such signal success? To ascertain that the people want it one only has to ask the first 100 intelligent men he meets to find an almost unanimous demand for cheaper telegraphy. Every new settlement in our distant Territories, every extension of the boundaries of our growing cities, every increase in the trade and commerce of the country make the telegraph more and more indispensable to the people in cheaper messages of few words for the poor, who sometimes have need for messages of anxious affection or urgent affairs, and in messages at present rates, but of twice as many words, for the rich, who are conducting business enterprises. For the quick transfer of money from money-order offices it is imperatively necessary.

The electric current belongs to the people by right and is bound to become their servant, not of a class, nor of one sixty-fourth part of the population, as at present. So soon as the post office can blend it with its own system, and use its own forces already under pay, telegraphic rates will be reduced. Most adroit opponents of postal telegraph couple with it a like regulation of the railroads, but the Government already employs the railroads as post roads, and the form in which it is proposed to contract with telegraph companies is precisely the same as that by which we have employed railroads ever since they were built. The business of the railroad is to carry freight and passengers, which is foreign to the purposes of a post office. This is not true of the telegraph or telephone, both of which, by their very nature, are limited to the service of cheap and rapid exchange of communication between the people, and this is what the post office was founded for.

To propose to include in the problem the transfer to Government ownership of bake shops or breweries or anything else is an attempt to conceal the real issue, unless it can be shown that such agencies are necessary to enable the Government to perform its constitutional functions. Any argument that can justly be made against the union of the telegraph with the post office applies with equal force against the administration of the post office itself by the Government.

In the very nature of things, if the post-office work were turned over to-day to any monopoly operated for private profit, there would be hundreds of large sections of the United States deprived of post-office facilities altogether to save the enormous expense now incurred in reaching the remote points. The postage between large cities would be afforded at present rates, but in all the country districts postage rates would advance, and rise higher and higher, according to distance from railroads. Who would choose to go back to the postal system of long ago? Why should we meekly suffer a telegraphic system based on similar principles? Without restating the arguments in my former reports, which I still consider unanswerable, in favor of bringing the telegraph and post office together, I reaffirm them all with increased emphasis, and upon the same lines, and add, further, my belief that the time has come to join to the post office the use of the telephone.

* * * * *

In America, in 1870, 10,646,000 telegrams were transmitted, or about one to every four of the population. Under the corporate system fewer telegrams were sent in England than in America, but after the union of the telegraph with the postal service the number rapidly increased, and now nearly twice as many are sent in England as in America in proportion to population. In the year 1884–85, 33,278,000 telegrams were transmitted in Great Britain; in the year 1890–91, 66,400,000, an increase of 100 per cent in six years. In America, in 1885, 42,096,000 telegrams were transmitted; in 1891, 59,148,000, an increase of only 40 per cent. Now, contrast the business of the post office of the two countries during the same time. The increase in the number of letters and pieces transmitted in our post office was 1,718,728,895, or 65 per cent; in Great Britain the increase was 616,310,383, or 31 per cent.

The growth of the telegraphic business in America is much less rapid than the postal service, or the railroad or steamships, or any other large public business. The reason is evident, for the telegraph is the only public business carried on by private parties without competition, unless the telephone should be considered public business. There is more need of the telegraph in America than in England, as our population is more widely dispersed, and its value depends on the time gained over the mail. In England it is reckoned by minutes, but the rates are so low that its use is general, and it is rapidly increasing. In America the time saved is counted by hours and days, but the rates are so high that it is used mainly by speculators. The growth of the telegraph is much less rapid than in England.

* * * * *

There are about 64,329 post offices in this country and 20,098 telegraph offices, a large proportion in railroad stations remote from business centers where the service is performed by railroad officials. The business of the post office and telegraph depends largely upon the facilities offered to the public. Where there is neither post office nor telegraph office there will not be any correspondence to speak of. Give the same community proper facilities and a large correspondence will develop. In England the telegraph offices are accessible to the people. In America the average distance to telegraph offices from the post office is about 7 miles, as proven by recent reliable reports. If each of the 64,329 post offices transmitted only three telegrams a day it would amount to 70,000,000 a year, or nearly 20 per cent more than are now sent. The larger proportion would be in addition to those now sent, for a new business would be created by the new facilities. Who can doubt that on an average four telegrams would be sent per day from these offices?

Over seven times as many messages are sent to-day as were sent 22 years ago, and yet the population has not nearly doubled. Many petitions were presented to the last Congress in favor of a postal telegraph, and but very few in opposition. Many newspapers believe that they are dependent upon the Western Union Telegraph Co. for news and naturally oppose the postal-telegraph system, but a larger number of papers of lesser circulation favor the postal-telegraph system. It is emphatically a measure of the people and for the people, and is not and has not and can not be made a party measure.

The union of the two systems has been advocated at different times by Postmasters General of each of the two great political parties. A bill providing for this union unanimously passed the Senate Committee on Post Offices and Post Roads at the last session of Congress, and though the bill was defeated in the House committee there was no division on party lines.

The rapid transmission of correspondence is a part of the business and proper duty of the Post Office Department, and it does not fulfill its functions or perform its full duty until it operates the telegraph, the most rapid means of transmission of intelligence. The press is more deeply interested in the union than the people, because it is dependent in large measure for telegraphic news.

REPORT OF POSTMASTER GENERAL WANAMAKER: 1892.

In the concluding report of his administration as Postmaster General for the year ended June 30, 1892, Mr. Wanamaker, beginning with a reference to a statement made by Hon. Cave Johnson, Postmaster General in 1846, again urges the adoption of his plan to contract with some telegraph company to connect post offices by telegraph, commencing with the most important offices and proceeding gradually in the order of probable usefulness, reducing the cost of telegrams by the use of post-office buildings, the use of telegraph stamps, the collection of messages in street or house boxes and the delivery by carriers, contracting with the company to perform service with its own operators for a fixed sum per message which the department would charge the people, adding a 1-cent stamp for local delivery and a special-delivery stamp when instant delivery is desired. He advances no new argument, but makes the following significant statements which closely approximate, if they do not describe exactly, the conditions existing to-day:

> It was said long ago that the telegraph must be a monopoly, and so is the postal system; but the difference is that one is operated for private gain and the other for the public good. The Government follows a settler across the plains and into the mines, and establishes a post office in order that his family may have letters and newspapers and be more content in a frontier home. The telegraph goes where it can find paying business only; and so it falls out that only a sixtieth part of the people of the United States, owing not to the need but to the inconvenience and the charges, employ the telegraph. The post office helps to settle, serve, and satisfy the country—literally to make the country, and of all its adjuncts the most important—that which would afford the quickest mode of communication between families near and far—apparently can not be made available in any way.
>
> The fact is that in some respects the telegraph seems to get farther and farther away as capital and power of the great corporation increase. Many telegraph companies have been established from time to time, but to-day there are but two independent companies. All but one have been in some form identified with the one corporation, and the one to be excepted, that is not yet known to have surrendered, is admittedly operated in concert with the other by joint traffic agreement. Practically, so far as the public is concerned, there is but one telegraph company, and however ready parties might be to invest capital in a company to erect lines and contract with the Government for a low-rate limited postal telegraphic service, the fear of bankruptcy by reason of such formidable opposition debars all such enterprises. It is not alone the powerful syndicate of owners of the telegraph company that must be met and pursuaded, but there are other interests connected with the telegraph business that stand out against all measures looking to a telegraphic service in any form by the Government.

Mr. Wanamaker quotes from the annual report of this corporation for June 30, 1892, and makes the following comment:

> This enormous business, producing gross revenues nearly one-third as large as the entire revenue of the Post Office Department, increases every year. Last year the increase was $672,078, and each year the amounts added to the surplus make the property more and more valuable, as there will probably be stock dividends in the future as in the past. I am pleased to have the company's official statement proving that the agitation for postal telegraph has not, as some argued, impaired the value of "vested rights."
>
> All these facts are stated here for two reasons:
>
> (1) To show the growing power and increasing independence of the rivals of the Post Office Department in the messages carrying business,
>
> (2) Respectfully to suggest the propriety of an inquiry into the cost upon which telegraphic charges are based, in the interest of the people who expect the Post Office Department to treat all questions that concern correspondence.

He then discusses the possibility of reducing the rates, and says:

> The increase of business on lower rates would be so large that the profits of the telegraph company, in my judgment, would not be diminished. It can not be questioned but that the Government, by reason of what it would save in the use of existing postal machinery, could easily by this time have offered much lower rates than the present telegraph charges if it had continued to operate the lines it began. The people think much more about these things than they are commonly supposed to, and they are restive under conditions which they feel that the Government should change. As early as 1844, Henry Clay was advocating ownership of the telegraph. He wrote:
>
> "It is quite manifest it is destined to exert great influence on the business affairs of society. In the hands of private individuals they will be able to monopolize intelligence and to perform the greatest operations in commerce and other departments of business. I think such an engine should be exclusively under the control of the Government."

DISCUSSION OF POSTAL TELEPHONE BY POSTMASTER GENERAL WANAMAKER: 1891 AND 1892.

Mr. Wanamaker was the first Postmaster General to advocate Government ownership of the telephone service. In his annual report for 1891 he included the following statement:

> A year from next March the telephone patent expires, and unless Congress acts promptly to authorize its adoption for communication among the people, it requires no stretch of the imagination to believe that in the next two years one immense syndicate will unite and control all the hundreds of telephone plants of the country, as the telegraph is now controlled, or the two will be united, and then for the next 20 years the most astute attorneys will be legitimately earning large salaries in indignantly opposing the so-called attacks of future Postmasters General upon defenseless vested rights.
>
> One-cent letter postage, 3-cent telephone messages, and 10-cent telegraph messages are all near possibilities under an enlightened and compact postal system, using the newest telegraphic inventions. The advantages of tying the rural post office by a telephone wire requiring no operator to the railway station must be obvious. The benefits arising from telephonic connections with the post offices will easily suggest themselves in a hundred ways to those who want the entire people to share in common privileges. The rural population would be the greatest gainer. A telephone message from the post office to the railroad station miles away to ascertain if expected freight had come would save the farmer many a needless wagon trip over bad roads; news of approaching frosts could be promptly spread over the country districts and fruit-growing regions, and many a valuable crop saved.
>
> The day's market price for cattle and grain and wool and produce may be obtained by the farmers direct by inquiry from others than by the buyer who drives up to the farm in his buggy. All these may seem homely purposes to dwellers in cities, but country life would lose some of its drawbacks by the extension of such facilities to those who bear their full share of the burdens of the Government, and receive, in postal respects at least, less than their share of its benefits.
>
> It is not chimerical to expect a 3-cent telephone rate; the possibilities of cheapening the management of these new facilities are very great. All account-keeping could be abolished by use of stamps or "nickel-in-the-slot" attachments. Collection boxes everywhere in the cities, and many places in the country towns, would receive telephone and telegraph messages written on stamped cards like postal cards. Old soldiers and others could find employment as collectors, and frequent collections would abolish the present expensive messenger-boy system. that adds 2 cents to the cost of 90 per cent of city telegrams. In New York City alone there are 33 collections from letter boxes every day, and at certain hours in the most thickly settled part of the city the letter boxes are emptied every 10 or 15 minutes.
>
> The delivery by letter carriers held to strict account would also be an improvement over the present system of messengers, who rarely hurry except in pictures. Who has not lost a train or missed meeting a friend by a message that started in ample time being delayed in delivery? The system recommended would not forbid private telephones or telephone exchanges in cities any more than it would exclude the use of the telegraph by railroads having their own lines. The plan contemplates only the convenience of the people in the use in common of their own post offices as the neighborhood station for telephoning and telegraphing. They have a right to claim this, as not a penny of additional expense is necessary for rents, heat. light, or attendants for telephonic service.
>
> For telegraphing only an operator is needed when business justifies it, otherwise a telgraph message would be forwarded by phone to the nearest telegraph station.

Postmaster General Wanamaker refers again to his recommendation for a postal telephone in his report for the fiscal year 1892:

> I pointed out in my last report that the telephone patents expired in March and that we should then probably see combinations and monopolies, as with the telegraph. Considerable discussion has resulted. It has only been equaled by the onslaughts on the other and many have found pleasure and logic too, as they suppose, in denouncing one and not the other.
>
> At the small and suburban post offices electrical communication should be established with other post offices and with telegraph offices. Numberless advantages for local as well as distant service occur to anyone. Weather reports would be spread, announcements of meetings heralded, physicians called, and countless errands done. The use of the telegraph would be greatly increased; so with the use of the telephone. And with it all the volume of the mails would grow, and what is more, the Postal Service would really be fulfilling its constitutional purpose of transmitting intelligence.

REPORT OF POSTMASTER GENERAL BISSELL: 1893.

The disastrous financial panic of 1893 and the consequent depression was reflected the following year in the annual report of Postmaster General Bissell, who took a conservative attitude and deprecated not only the acquisition by the Government of the telegraph service but *any* new departure in the extension of the Postal Service. So impressed was Mr. Bissell with the need for retrenchment that he formulated the following argument well calculated to convince a people just emerging from the greatest economic catastrophe since the Civil War:

> The suggestion has been made so frequently in recent years that the Government should provide and maintain a telegraph system which, if adopted, would naturally make it a part of the Post Office Department, that I have given the subject considerable study.
>
> In its favor it has been argued that the business of the telegraph is inherently the same as that of the mail, to wit, to transmit messages from one person to another; that it could be conveniently annexed to the Post Office Department because of the latter's already existing organization of offices, free delivery, special carriers, and general officials, and that, through the saving of direct expenditures for many leading items of cost, the public would secure a quick and thoroughly reliable service at much lower than commercial rates.
>
> It is further argued that the system ought to be adopted in this country because it has been in many others. My immediate predecessor in office seems to have spent a considerable amount of time in the study of this subject, reaching the conclusion, as have others, that the system should be adopted.
>
> My study of the subject, coupled with my experience as an officer of the Post Office Department, leads me to a contrary conclusion. In some of the leading countries of the world the postal-telegraph is a source of profit, but not so in all of them; but even where profitable it is operated within the limits of postal territory long since defined. The conditions of the Postal Service in this country, however, are so widely different as to induce the belief that a postal-telegraph system in the United States would add enormously to the already large deficit of the Post Office Department.
>
> I believe it to be the true policy for this Government to continue for a number of years the development of the Postal Service on present lines. We are far from reaching the full benefits that can be derived from the free-delivery system, the railway mail, the money-order, or even the star service. Until these benefits are greatly enlarged and perfected, and until our better classes of service are substituted for the more crude in vast areas of territory in which the latter are alone justified under existing conditions, additional features should not be adopted; at least such as would bring an additional burden to the department in the way of deficiency of revenue.
>
> Moreover, I am not prepared at this time to say that a telegraph service could be fully accomplished without material changes supplementing the present post-office organization, and without incurring heavy additional expenditures. To undertake such a service simply through the instrumentality of the present organization would have a tendency at once to cripple the existing Postal Service, because its present organization is without a reserve; and this would result, in all likelihood, in an imperfect postal-telegraph, which would not be satisfactory to the public even at reduced rates.
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> The public would naturally expect better service and cheaper rates from governmental control, and there would have to be sufficient power vested in the Postmaster General to enable him to accomplish these results should the Congress legislate in favor of the telegraph service, even though it should involve the expenditure of amounts greater than the receipts.
>
> It would seem that a comparatively small country, territorially, like Great Britain, with its large population, great commercial interests, and distribution of cities, would furnish as favorable conditions for the operation of a successful governmental telegraph system as any in the world; yet the report of the British Post Office Department to the House of Commons, dated November 27, 1893, shows the cost of the plant, up to the end of the fiscal year 1893, to have been $52,930,388. Interest upon this amount, at the rate of 2¾ per cent per annum, is charged in the current account and amounts to $1,455,584.
>
> In the operation of the service there was a further loss of $811,741 so that the total deficit for the year amounted to $2,267,325. The deficiencies have been continuous since 1876 and have aggregated, since 1872, $24,006,432, and in the last 10 years the average deficiency has been nearly $1,700,000. In Great Britain the postal service proper yields a large revenue to the Government, and so, in one sense, it can be said that it can afford the luxury of a postal telegraph. Under our postal system, however, partly undeveloped as it still remains, a telegraph system would be operated at a great loss to the Government; and this burden, it seems to me, should not be added to the Post Office Department.
>
> If the establishment of a telegraph plant in a compact country like Great Britain would cost over $52,000,000, what would be the cost of establishing a plant for this country? I will not stop to make a computation; but one can see at a glance that the cost would be many times that of the British plant and the annual interest charged many times $1,455,584; and if the loss in operation were over $800,000 in that country in one year I should think it would be many millions of dollars in a country the size of ours, with its unequal distribution of population.
>
> There are in this country to-day two post offices separated from each other by post route more than 6,000 miles. It is true that we have, in round numbers, more than 170,000 miles of railroad post route, but I beg to call your attention to the fact that we still employ star service to the extent of 70,000 miles in excess of all the railroad and steamboat routes in the country combined.
>
> I reach the conclusion, therefore, that as a business proposition the Government can not afford at this time to establish a postal telegraph system. I believe it would be very unprofitable in itself and that it would tend to retard the development of our existing postal system. It has been opposed by some on the ground that the Government has not the power under the Constitution to establish telegraph routes; others doubt the expediency of increasing the number of employees in the public service.
>
> While I have considered the subject from a purely business and postal standpoint, still I may add the remark that if the Government were to establish such a system there would be limitless difficulty in determining the character, quality, and amount of service that should be accorded to the various sections of the country productive of wrangling and jealousy which might profitably be avoided unless some advantage could be attained greater than any that is ever likely to result from the establishment of a governmental telegraph.

ARGUMENT OF JUDGE WALTER CLARK.

[An epitome of a pertinent article by Judge Walter Clark, entitled "Telegraph and Telephone," that was published about this time in the American Law Review.]

Article I, section 8, of the Constitution includes the provision to "establish post offices and post roads"; in 1836 Hon. John C. Calhoun, leader of the strictest constructionists in the United States Senate, said "It must be borne in mind that the power of Congress over the post office and the mail is an exclusive power"; and these words have been cited and approved by the Supreme Court of the United States in the case of ex parte Jackson (96 U. S. Reports, p. 784). The Supreme Court of the United States, in a unanimous opinion, has held that the telegraph came within the grant of power to establish the post office. That opinion, delivered by Chief Justice Waite, says:

> The powers thus granted are not confined to the instrumentalities of the postal service known or in use when the Constitution was adopted but they keep pace with the developments of time and circumstance. They extend from the horse with its rider to the stage coach; from the sailing vessel to the steamboat; from the coach and the steamboat to the railroad, and from the railroad to the telegraph, as these new agencies are successively brought into use to meet the demands of increasing population and wealth.

Justice H. B. Brown, one of the ablest members of the United States Supreme Court, says:

> If the Government may be safely intrusted with the transmission of our letters and papers, I see no reason why it may not also be intrusted with the transmission of our telegrams and parcels, as is almost universally the case in Europe.

Congress placed the same construction on its powers by the act of 1866, which provides that all telegraph lines thereafter built shall be constructed under the notice, and only after the company signing a contract, that the Government may at any time take over such telegraph lines upon paying the value of its material. The telegraph (so far as used by the public for hire) unquestionably comes within the exclusive grant to the Government of operating the post office. The telephone and telegraph are simply the electric mail.

> When the Government shall assume its duty of sending the mail by electricity railroad companies can still operate their own telegraph lines on their own business, and private telephone exchanges will still exist, just as the railroads and others may now send their own letters by their own agents (R. S., 3984), but not carry them for others for hire (R. S., 3982). Then, as now, the Government would only have the exclusive privilege of carrying mail for hire (R. S., 3990). This privilege of carrying mail for hire, whether sent by electricity, or steam, or

stagecoach, or on horseback, is an exclusive governmental function, and no corporation or monopoly can legally exercise any part of it.

* * * * * * *

There should be no dicker with private companies about leasing or purchasing. In 1866 they only asked for five years to close up, but when the five years were out they had formed the present great trust and have ever since defied the public. * * * Let the Government give the actual value of such wire and material as it may wish to use, and take complete and exclusive possession of the duties of a post office.

* * * * * * *

On January 29, 1870, all the telegraphs in the United Kingdom were acquired by the Government. Till then the districts paying best had ample service but at high rates, while whole sections off the lines of railway had no facilities for telegraphic messages. The Government at once extended the telegraph to all sections and reduced the rate to 1 cent a word. The following is the result:

In 1870, under private ownership, 7,000,000 individual messages and 22,000,000 words of press dispatches were annually sent. Now that the telegraph is operated by the post office the annual number of individual messages sent is 70,000,000 (10 times as many) and over 600,000,000 words of press dispatches (30 times as many) are used. This, at a glance, demonstrates the overwhelming benefit to the public of the change and their appreciation of it.

In London the telegraph has largely superseded the mail for all the small and necessary details of life, over 30,000 telegrams being sent daily in that city alone.

The service performed is with the utmost punctuality. It is calculated that the average time employed to-day in the transmission of a telegram between two commercial cities in England varies from 7 to 9 minutes, while in 1870 (under private ownership) 2 or 3 hours were necessary.

The rate of 1 cent a word includes delivery within the postal limits of any town or within 1 mile of the post office in the country. Beyond that limit the charge is 12 cents per mile of delivery of a message. The telegraph being operated as a constituent part of the postal service, it is not possible to state how much profit the Government receives from it, but the English Government does not consider that it should be treated as a source of revenue. It regards it as a means of information and education for the masses and gives facilities of all kinds for its extension in all directions.

* * * * * * *

According to English experience the transfer of the telegraph to the post office department would result in (1) a uniform rate of 10 cents for 10 words between all points, or possibly less; (2) an increase in individual messages of at least 10 for every 1 now sent; (3) an increase in press dispatches of 30 words or more for every 1 sent now; (4) a popularization of the telegraph for all uses, social or business; (5) an increase in the promptness of delivery, the average there being now 7 to 9 minutes as against 2 to 3 hours formerly; (6) no section would be destitute, but at each one of our 70,000 post offices there would be a telephone or telegraph. By adopting the telephone at most post offices, instead of the telegraph, the increase in the number of post-office employees would be inconsiderable.

SYNOPSIS OF ARGUMENT PREPARED BY PROF. FRANK PARSONS.

Statistics from 75 of the principal nations of the world show that the Government owns and operates the telegraph in all except Bolivia, Cuba, Cyprus, Hawaii, Honduras, and the United States.

Henry Clay, Charles Sumner, Hannibal Hamlin, Gen. Grant, Senators Edmunds, Dawes, Chandler, and N. P. Hill, Gen. B. F. Butler, John Davis, Postmaster Generals Johnson, Randall, Maynard, Howe, Creswell, and Wanamaker, Prof. Morse, the inventor of the telegraph; Cyrus W. Field, the founder of the Atlantic cable and a director in the Western Union Co.; James Gordon Bennett, Prof. Ely, Lyman Abbott, B. O. Flower, Judge Clark, Henry D. Lloyd, Dr. Taylor, T. V. Powderly, Samuel Gompers, Marion Butler, and other eminent men in every walk of life have championed Government ownership in America. Legislatures, city councils, boards of trade, chambers of commerce, and labor organizations; numerous newspapers, and the Prohibitionist and Populist Parties, favor it. Opposition is confined to the capitalists controlling the present private system of telegraphy. Senator Edmunds in 1883 introduced a bill to establish a postal telegraph; another in 1885, and another in 1887. Senator Dawes from 1873 to 1888 introduced four bills to provide for the transmission of correspondence by telegraph. Altogether more than 70 bills have been introduced into Congress for the purpose of establishing a postal telegraph. Eighteen times committees of the House and Senate have reported on the question, sixteen times favorably and twice against. Of the two adverse reports, one was a 2-page document, mildly expressing the opinion of the committee that the telegraph monopoly should be regulated, but that public ownership was not best because of the increase of patronage and because the committee thought it would cost more to run it under governmental control. No evidence was taken, no investigation was made. The other adverse report was made in 1869, upon the ground that the five years of security given to the companies by the law of 1866 had not elapsed.

The Constitution intrusted to Congress the power "to establish post offices and post roads." This power is interpreted by the Supreme Court to mean the transmission of intelligence in any form and by any means. It is therefore the positive duty of the Government to use the telegraph as a factor in the postal service.

A large part of the people have no facilities for transmitting telegraph messages under the present private-ownership plan. The advantages of a change are apparent when it is shown that the Western Union has 21,000 offices and the post office 70,000.

Telegraph rates in this country are 25 cents to $1 for 10 words and 2 to 7 cents for each word in addition; the night rates are somewhat less. In Europe the usual rate is about 10 cents for 20 words and one-half a cent to a cent for each further word. The figures submitted by the Western Union to show that the distances in this country are much greater than in Europe were greatly exaggerated.

The Western Union claims that wages are much higher in this country than in Europe. On data furnished it appears that the average salary of operators in this country does not exceed $333, while the average in Europe is $320, but in many cases, Great Britain and France, for instance, the average salary of the operators is much greater than in this country. Besides, according to the Western Union, the operators in this country do twice as much work as European operators.

In attempting to justify its charges the Western Union claims that Europe operates the telegraph service at a loss. On the contrary, France, England, Switzerland, Sweden, Prussia, Belgium, and other countries make a profit, and Europe as a whole does the same. The Western Union ciphered out a loss for Europe by adding the cost of construction into the operating expenses. Rates are higher here because private enterprise aims at dividends, while public enterprise is satisfied to serve the people at about cost. In Great Britain the 18,000,000 messages sent in 1873 under public ownership cost the public just what 9,000,000 would have cost under the displaced private ownership. In the spring of 1895, Mr. Wanamaker stated that he thought a uniform 10-cent rate for 20 words, regardless of distance, could be established and yet leave the system self-sustaining. He based his opinion on the rates before the Western Union absorbed other companies and shut off competition.

The Western Union reports its stock at $95,000,000, and bonds $15,000,000—$110,000,000 of capitalization. It claims 190,000 miles of line, 800,000 miles of wire, and 21,360 offices. The figures, however, are false. Three-fourths of the offices are railway offices maintained by the railways. And the mileage appears to have been obtained by adding together the mileage of all the lines the Western Union has ever built, bought, or leased, a large portion of which has long since ceased to exist; and another portion, consisting of useless parallels constructed on purpose to be bought by the Western Union, remains on its hands as mere lumber. The total land plant in actual operation under Western Union control is probably less than 100,000 miles of poles and 400,000 miles of wire, and the larger part of this is not in good condition. The total value of the plant, offices and all, appears to be about $20,000,000. Subtracting the $15,000,000 of bonds we have $5,000,000 of property which the stockholders own after paying their debts—$5,000,000 as the total tangible basis of $95,000,000 of stock. The evidence of all this is voluminous and convincing.

The present telegraphic system in America is indicted for its illtreatment of employees and a general abuse of the employing power—child labor; overworked operators; long hours and small pay for those who do the work; less wages to women than to men for the same work; favoritism and unjust distinctions between men in the same service; a settled policy of reducing wages and increasing work; denial of the right of petition, the right of organization, and the right to consideration because of long and faithful service. In 1890 the evidence was that the average pay of telegraph operators was $40 to $45 a month, that girls were employed in some instances as low as $12 to $15 a month, and quite a number were paid no more than $20 to $35. Abuse of the employing power such as listed above results in strikes and poor service, manifested in slowness, inaccuracy, insufficient facilities, failure to guard the secrecy of messages, etc. Examples are cited illustrative of these features. The Western Union Co. is charged with "discrimination between the messages of different customers, both as to rates and order of transmission." Instances are given. Monopoly of the news service results from private ownership of the telegraph. Reference is made to the censorship of the Associated Press under its arrangement with the Western Union.

Misgovernment and political corruption are evils to which the private telegraph contributes, through a distribution of franks to Government officials, both State and Federal.

Another evil of private ownership of the telegraph is the dangerous concentration of power and wealth in the hands of a few irresponsible persons. The Western Union in its compact with the newspapers reserves to itself the exclusive right of furnishing commercial and financial news to individuals and associations; and

For the purpose of giving fabulous fortunes to its inside managers and their friends the Western Union need not send untrue market quotations. It has only to give the true quotations a single hour, or less than that, in advance to those whom it means to favor and the work is effectually accomplished. No such power should be allowed to exist in this country; the temptation to abuse it is enormous and will sooner or later prove to be irresistible.

In the hands of private individuals the telegraph enables them to monopolize intelligence and to perform the greatest operations in commerce and other departments of business.

The present telegraph system is a menace to the national strength in time of war. The telegraph is one of the most important instruments of war and the Nation ought to own the system on military grounds, if there were no other reason.

Private monopoly means taxation without representation. The monopolist is able to charge more than his service would be worth in a fair competitive market. Government is a union of all for the benefit of all.

The argument for a national telegraph does not rest solely on the ground of unifying interests and removing private monopoly with its power of taxation for private purposes and without representation, but also on the ground of experience demonstrating its superiority, the movement of civilization in the direction of national cooperation in the conduct of affairs of national extent, the trend of thought and events in that direction in the United States, the overwhelming public sentiment in favor of a national telegraph, the constitutional duty of the Federal Government to use the telegraph in the conveyance of the people's correspondence, the aid a national system will give toward a better diffusion of wealth, a fuller development of business and social life, and a more perfect national coherence in peace and in war, the economies it will effect, the lower rates, improved service, wider facilities, better conditions of employees and the press, cessation of telegraph discrimination, fraud, and corruption, the impetus that will be given to civil-service reform, and many other advantages.

Economy, good service, and general satisfaction have characterized the national telegraph service abroad, while in this country the opposite is true.

The results of public ownership of the telegraph and telephone may be briefly stated thus. The rates are much lower than under the private system and the facilities better. A Government telegraph goes where private enterprise will not go. The popular use of the telegraph is vastly greater in Europe than with us. The proportion of social business is six, eight, ten times more than it is in the United States. The general service is more efficient, swift, and accurate than with us. The public telegraph has proved of incalculable value in the apprehension of criminals, being used much more freely by the Government than the very costly service of a private system is apt to be. * * * The employees are better treated and the aim is to improve their condition from year to year. There is no telegraph discrimination, no telegraph lobby. There is no watering of telegraph stock, no dividends on real or fictitious stock, no strikes of operators, no blackmailing lines or wasteful construction. There is no manipulation of market reports. The various governments display a progressive spirit, adopt new inventions, and lower the rates from time to time as fast as it seems to be practicable. As a rule, there is a margin of profit in spite of low rates, and the sum total of yearly results in Europe generally shows a surplus of receipts above the cost of operation in spite of the low rates and extended lines. At the least calculation the people of Europe save $25,000,000 a year through government ownership of the telegraph.

Postmaster General Wanamaker advocated the plan of contracting with one or more telegraph companies to connect the post offices with telegraph lines, supply the instruments and operators, and carry messages at low rates as a part of the Postal Service. His idea was to begin by connecting all the free-delivery offices and gradually extend the lines to all post offices. A postal telegram could be deposited in any post office or post box, or in any telegraph office of the contracting company. The charge would be 10 cents for 20 words for 300 miles or less, not over 25 cents for distances up to 1,500 miles, not over 50 cents for any distance, nor more than 1 cent a word for words beyond the first 20. Two cents would go to the Government for its services in collecting and delivering the message and the rest would go to the telegraph company. New York capitalists were eager to contract with the Government on the Wanamaker basis or the basis of a uniform 25-cent rate regardless of distance. This plan avoids the objections usually urged against a public telegraph. It would not increase the Government patronage, nor require any public expenditure, nor limit private enterprise, and yet it would render the country an inestimable service by cheapening the telegraph and making it more accessible to the people. Its disadvantages are that it still leaves the rates higher than need be in order to give the private capitalists the profit they demand; that although the business would be essentially a public one, carried on in the post office and largely by means of its labor and capital, yet the profit would chiefly go to private parties; that it would extend the pernicious contract system, which is far more liable to abuse than the patronage; that it does not eliminate the antagonism of interest between the telegraph management and the public; that it does not diminish but largely increases the telegraph stock to be gambled with and manipulated; that it leaves the telegraph workers to the mercy of corporate greed, etc.

The limited plan is vastly better than the present system. Mr. Wanamaker stated before the Bingham committee that the reason he had not advocated the Government ownership plan was because "there seemed to be an impression that you (Congress) do not want to make an appropriation." Senator Edmunds, before the Hill committee, in 1884, said:

> It seems to me for the best interests of the country that any appliance with which its welfare is so intimately connected as is the instantaneous transmission of intelligence should be subject to no censorship, to no corporate will, to no question of how it is going to affect stocks or the standing of corporations or persons, but it should be free to all men, as the post office is, and like the post office, subject to no espionage. It is essential, I believe, at this time to the interests of the United States, and growing more and more so, in connection with great social questions, and the aggregations of vast sums of money under corporate power, that this Government telegraph, on the constitutional principle stated, should be undertaken independently and subject to no contracts or arrangements with parties.

Another way of handling the telegraph question would be to lease lines from private companies and operate them by the postal force. This would be better than the first plan, with a good civil service, since it accomplishes the same extension of facilities and still greater reduction of rates. The objections are that it would still pay out a considerable rental profit which had better stay with the people and it would retain the contract method to some extent.

A third plan would be for the Government to buy existing lines and connect them with the post-office system. One trouble with this plan is that existing lines are in large part of very inferior quality and the people would probably have to pay five or six times the value of the telegraph. In a speech on the floor of the Senate January 20, 1883, Senator Edmunds stated that he was not in favor of the Government purchasing existing lines, but that he favored the building of its own lines by the Government. Senator John Sherman, of Ohio, expressed himself in a similar manner, and in 1888 the Committee on Commerce stated that it was its belief that the Government should construct its own lines.

A fourth plan would be for the Government to ask private parties to build the lines, or supply the money for building them, on condition that said parties should receive a specified interest on their capital; that all profits beyond said interest should go toward paying off the principal, and that when it should be entirely paid the lines should revert to the Government free of debt—a sort of building loan association plan. It might be agreed that the operation of the lines during the period of payment by installments should be in the hands of the builders or of the Government, or of trustees for both. This plan requires no public debt, but the people lose on the interest, which is usually 6 or 7 per cent in such cases instead of the 3 per cent for which the Government can borrow.

A fifth plan would be for the Nation to build a telegraph system for itself. It may first build lines connecting the great centers of population, and the revenue thus obtained from year to year could be used to extend the lines, or it may establish a comprehensive plant at the start. The construction and maintenance of the lines could be placed in charge of the Engineer Corps of the Army. We educate at West Point men possessed of the latest scientific knowledge, and they would do the work excellently, saving the Government immense sums that the telegraph builders ask for supervision and profit. The rank and file of the Army might also supply a part of the ordinary labor required for construction and maintenance.

Superintendence of the office work could be confided to the postal officers, with very little addition to the force. Mr. Wanamaker stated that in three-fourths of the post offices no additional attendant would be needed. In England the regular postal staff does the telegraphing in all the small offices. One-half of the regular staff in Belgium are telegraph operators.

A large saving would be made in rentals and the cost of heat and light. The Government would not have to pay dividends on watered stock or on the real investment. Costs of litigation, counsel fees, lobby expenses, and big salaries would be saved. There would be no building of useless lines nor wastes of competitive telegraphy, the money abstracted from the people by the discriminative use of the telegraph for speculative purposes would remain in their pockets, and the cheapening of communication would bring the whole people closer together, give them a better understanding of the markets, and develop the business transactions of the continent.

The Western Union claims that while there would be a large increase in business from a reduction of rates the expense would increase in proportion, but this statement is refuted by statistics furnished by the attorneys for the Western Union, which show—

	Number of years.	Per cent of increase in business.	Per cent of increase in expenses.
Germany	6	259	83
Belgium	5	252	61
Holland	5	142	62
Denmark	5	149	38
United States	5	80	27

It is estimated that where there is no material change in the plant or wages of employees, a 100 per cent increase in business occurring by reason of a reduction in rates is accompanied by an increased expense of not more than 33 per cent.

Judge Walter Clark, of the Supreme Court of North Carolina, proposed that the legislature of each State should pass a law reducing the telegraph rates to 10 cents for 10 words between any two points within the State. A bill was introduced in the North Carolina Legislature to reduce the rates to 15 cents, but the Western Union, through a lobby, beat the measure by one vote. In July, 1897, the railroad commissioners took action and fixed the rate at 15 cents. The Western Union Co. have taken the matter into the Federal courts, declaring the new rate unreasonable, and it probably is, in that it is too high.

TESTIMONY OF PROF. EDWIN R. A. SELIGMAN.

The following testimony of Prof. Edwin R. A. Seligman, professor of political economy and finance in Columbia University, is taken from the Report of the Industral Commission for 1900:

> Prof. Seligman considers that upon the basis of his three criteria of the desirability of Government ownership—namely, widespread social interests, amount of capital invested, and complexity of management—the argument for Government control of the telegraph is substantially as strong as for Government ownership of the postal service. (1) Unfortunately in this country the telegraph is not used by everyone; but this is because the charges are so much higher and the facilities so much less than in other countries, where the telegraph is managed by the Government. (2) As regards the capital invested, the requirements, though greater than in the case of the post, are yet very small as compared with other interests. The cost of putting up poles and stringing wires is relatively slight. If the existing companies were bought out,

there would be a capital outlay, but even then it would be insignificant when compared with the capital invested in ordinary enterprises or the means of transportation. (3) As to complexity of management, while the telegraph makes possible a somewhat higher demand than the postal service upon the skill of its managers, and while somewhat more effort is required to keep the service up to the level of the advances of science, the business is yet very simple as compared with others; for instance, with the railroads. The great end of individual initiative in industry in general is to turn all ability toward the reduction of cost by inventions, etc. Experience shows that "even such sleepy administrations as those of France and England" keep the telegraph service on a level with new inventions. That the post is a public service with us and the telegraph is not is an historical accident, due to the fact that the telegraph was not invented until 1844, and the postal service grew up in the seventeenth and eighteenth centuries."

It appears further that Prof. Seligman would favor the purchase by the Government of the existing telegraph systems and would be opposed to governmental competition with private enterprises.

EXCERPTS FROM REPORT OF THE INDUSTRIAL COMMISSION: 1901.

Following is a synopsis of parts of the Annual Report of the Industrial Commission for the year 1901:

Testimony of Frank Parsons, president of the National Ownership League, pages 112–193; Albert B. Chandler, chairman board of directors of the Postal Telegraph-Cable Co., pages 193–206; Thomas F. Clark, vice president, Western Union Telegraph Co., pages 206–241; A. L. Randall, chairman International Typographical Union committee on Government control and ownership of the telegraph, pages 241–265; F. C. Roberts, member of the International Typographical Union, pages 266–274; and Romyn Hitchcock, consulting chemist and technologist, New York City, pages 890–896.

According to the testimony of Mr. Clark (Digest, CCIII), the Western Union Telegraph Co. in 1900 had 192,705 miles of poles and 933,153 miles of wire, with 22,900 offices; while for the same year the Postal Telegraph Co., according to Mr. Chandler, its president, owned or controlled 26,042 miles of poles and 169,236 miles of wire, not including its Atlantic cables, and maintained 20,781 offices. The Western Union Co. transmitted 70,000,000 messages of all kinds in 1900 and the Postal 16,524,444.

Prof. Parsons, referring to the capitalization and profits of telegraph companies, states (Digest, CCIV) "that of the $95,000,000 of stock of the Western Union Telegraph Co. (in 1900) a very large part is water; $60,000,000 of the stock represents less than $10,000,000 of actual value, and $35,000,000 represents largely stock dividends which can not be analyzed. The highest estimate any legislatiye committee that has investigated the matter has ever placed upon the amount of money paid in by the stockholders is $16,000,000. * * * The railroad commissioners of North Carolina in 1897 had made an extensive examination and came to the conclusion that about $5,000,000 was the actual value of the Western Union Telegraph Co., over and above its bonds. From the best information obtainable, says the witness, it appears that the plant could be duplicated for from $20,000,000 to $30,000,000 at the outside."

Prof. Parsons says further that when an attempt was made in Ohio to increase the taxation of the Western Union lines the assessment was fixed, on the basis of two-thirds of the value, at $2,000,000 for the 8,272 miles of line in the State.

"The company claimed that the property should be assessed at not more than $647,000 and that the total cost, including all wires on a line, and including also the cost of stations and equipment, was on the average of $103 per mile of poles. On this basis the total 190,000 or 200,000 miles of poles owned by the company would be worth about $20,000,000."

Mr. Roberts quotes from the Washington Evening Star of 1893 to the effect that the paid-in capital of the Western Union Co. does not amount to over $10,000,000, while its stock amounts to over $80,000,000. The witness quotes also (Digest, CCIV) from the report of the executive committee of the National Board of Trade of November 15, 1882, which stated "that in 1858 the Western Union had a capital of $385,700; that 8 years later the stock had increased to $22,000,000, of which $3,322,000 was issued in the purchase of competing lines and $18,000,000 was issued in stock dividends; that afterwards when the United States Telegraph Co. was purchased by the Western Union, over $7,000,000 of stock was issued, which was alleged to be five times the value of the property taken in; and that in the purchases of other telegraph companies occurring subsequently practically the same proportion of stock was issued in respect to real value as in the cases mentioned."

Mr. Clark denies the charge of overcapitalization of the Western Union Co., and states (Digest, CCV):

"The total capitalization of the Western Union Telegraph Co., including the stock, the collateral trust bonds, and all other bonds and liabilities, amounts to $131,364,665. On this basis the capitalization per mile of poles in the United States is $703.80. Deducting the Atlantic cables from the wire mileage, the capitalization per mile of wire is $141.70. * * *

"Figuring the capitalization from another standpoint, and deducting $11,000,000 of assets from outside companies that are not telegraph companies and whose systems are not in any way comprised in its mileage, the capitalization of the Western Union is $120,364,665, or $645 per mile of poles and $129.80 per mile of wire."

Mr. Clark further stated that the claim that the lines can be reproduced for $120 to $130 per mile is preposterous; that it cost the company $100,000 per mile to construct the underground and pneumatic system for 3 miles in New York City; and that owing to varying conditions in the country it is not possible to make a reliable estimate of the average cost of constructing a mile of poles with 1 wire or the cost per mile of wire and the cost of terminals.

It will be noted that Mr. Clark places the capitalization of the Western Union at $645 per mile of poles, while it was claimed by the company during its litigation in Ohio that the total cost per mile of poles was only $103.

Mr. Chandler (Digest, CCVI) states that he has known a good single-wire telegraph line to be built for $150 per mile, and he has known single lines of telegraph in cities to cost $10,000 underground.

Mr. Chandler stated that at the time of its acquisition in 1897 by the Commercial Cable Co., the Postal Telegraph Co. was capitalized at $20,000,000, which covers its franchises, patents, and other requisites for carrying on a telegraph business.

Mr. Clark claims that according to the mileage given by the Postal Telegraph Co. in the United States it is capitalized at $782 per mile of poles and $121 per mile of wire.

(Digest, CCVI) Mr. Randall states that beginning in 1858, when its capital stock was only $385,780, the Western Union Telegraph Co. paid in dividends during the next eight years nearly $18,000,000; that the largest dividend declared by the company up to 1874 was 414 per cent; and that from 1858 to 1890 the average annual dividends amounted to about 300 per cent.

Prof. Parsons states that Postmaster General Wanamaker's investigation showed that stock in this company paid 300 per cent cash dividends per year from 1858 to 1890 and 150 per cent a year in stock dividends besides.

Mr. Clark states that (in 1900)—

"The annual gross earnings of the Western Union Telegraph Co. amount to nearly $25,000,000, while the gross expenses are about $18,500,000, which leaves a balance of something over $6,000,000 for dividends on the stock, for interest on the bonds, and for sinking-fund purposes, with a small surplus. The expenses for a year are made up of operating and general expenses, amounting to over $13,000,000; rental of leased lines, over $1,500,000; maintenance and reconstruction, nearly $3,000,000; taxes, a little over $500,000; equipment, a little over $300,000. The operating and general expenses for salaries amount to $9,000,000, or practically 50 per cent of the whole expenses, which does not include the salaries for regular linemen, special line gangs, and general labor expenses."

Mr. Chandler states that the Postal Telegraph Co. earned and paid 4 per cent dividends previous to the sale of the property and has just about earned the interest that has been paid by the Commercial Cable Co. on the bonds since the acquisition of the property.

Mr. Randall (Digest, CCVII) believes in uniformity of telegraph rates; he does not think distance should be considered, as nienteen-twentieths of the telegraphic business of the Western Union Co. is done within a radius of 1,000 miles of New York and rates on that business would pay for any deficiency in the revenues for longer distances.

Mr. Clark states that the commercial rates in some States are made up in different ways, the rate for a 10-word message being 25 cents for the whole State and special rates applying between States and large centers. The rates for local purposes all through the country, if not thus specially determined, are made up by a system of squares, a square being 50 miles each way, and the rate being 25 cents from any square to any two circles of contiguous squares. The highest rate charged for the country is $1, which is from the Atlantic to the Pacific coast, and there is no rate less than 20 cents.

Mr. Chandler states that the rates of the Postal Telegraph Co. for messages of 10 words, exclusive of date, address, and signature, range from 20 cents, applying locally in a few cities, to $1 from coast to coast, and that the average amount received per message during year 1900 was 34.2 cents. Rates are fixed on a zone system similar to that described by Mr. Clark.

Prof. Parsons states that the average telegraph receipts in this country are about 31 cents for ordinary messages.

(Digest, CCVIII), Mr. Randall and Mr. Roberts believe that the telegraph rates in this country are excessive.

Mr. Clark states that the average rate received for telegrams of all lengths by the Western Union Co. is 30.8 cents and the operating expense about 25.1 cents. These figures are obtained by dividing the total receipts and expenses by the number of telegrams. He asserts that distances in European countries are very short compared with those in the United States, and that in this country no charge is made for the address and signature of the message, while in European countries these matters are counted as part of the message, so that while the rates of European countries would appear on their face to be much lower than the rates in the United States, it would be found upon examination that a message in the United States costing 25 cents would average 21 words long, and at the rate of 1 cent a word, which is common in European countries, this would cost 21 cents for a 10-word message.

Mr. Chandler makes a similar comparison of rates in European countries and the United States.

(Digest, CCIX), Prof. Parsons in support of his contention that the rates in this country are excessive states that—

"In Great Britain a message from any point to any other point in that country may be sent for 12 cents. From any point in the States of Massachusetts, New York, Connecticut, or New Jersey, to another point in the same State it is 25 cents. The average charge for all messages in Great Britain is about 15 cents, as against 31 cents in the United States."

Mr. Clark, vice president of the Western Union Telegraph Co. (Digest, CCX), submits a table showing for each of the European countries and the United States the number of people, the miles of telegraph lines and telegraph wires, the number of offices, the messages sent, the receipts, the number of people to the square mile, and the number of people to 1 mile of wire (in 1900) in support of his contention that superior telegraph facilities are provided in this country as compared with European countries. He states that there are 76 people for every mile of wire in this country, as against 130 people to every mile in Great Britain; 188 in Germany; and 699 in Russia. Prof. Parsons, president of the National Ownership League, replies that 1 mile of wire to 76 people in the United States against 1 mile to 130 people in Great Britain proves nothing except the relative sparsity of population in the United States.

Mr. Clark states that by reason of the amalgamation of other small companies with the Western Union that company has been enabled to effect a reduction in its rates from an average toll of $1.047 received in 1868 to an average of 25.1 in 1890, but that he thinks a general reduction in rates throughout the United States is impracticable and would result in failure, for the reason that the physical capacity of the wires has been reached and increased business would necessitate large additional expense in the construction of other telegraph lines.

Mr. Chandler states that considerable reductions have been effected in the rates of the Postal Telegraph Co., brought about largely by the disposition to secure greater uniformity and to extend the limits within which specific rates prevail.

(Digest, CCXI), Prof. Parsons states that Postmaster General Wanamaker informed him that his investigation led him to believe that a uniform 10-cent rate in this country under Government ownership would be remunerative. He stated—

"There was a line of telegraph between Milwaukee and Chicago installed some years ago, on which a 10-cent rate was made, and the company paid back from 30 to 40 per cent of the receipts to patrons of the road after paying 7 per cent interest on the capital; subsequently it reduced the rate to 5 cents and still paid back from 25 to 40 per cent of the receipts to the patrons of the company, and the same time has doubled its stock, making it half water, thus showing some of the immense profits to be made in the telegraph service from low rates."

(Digest, CCXII), Prof. Parsons says:

"That England made a mistake when it bought out the telegraph companies by buying them all at once instead of one at a time, as Prussia had done with the railroad service. It also paid about four times as much as the lines were worth. Notwithstanding these disadvantages the rates were immediately lowered and the service increased and bettered in every way. Telegraph offices have been opened in the post offices and messages can be deposited in post-office boxes. The hours of labor have been shortened from 56 to 48 and 42, and wages increased. The public operation of the telegraph has brought about a harmony of interest. Press rates have been reduced to the lowest figure in the world to-day. The number of messages doubled in two years after the Government took possession and has subsequently very largely increased. * * * Where the rates are low and the facilities ample the masses of the people use the telegraph to a very great extent.

Mr. Clark states that the English telegraph is operated at a loss, brought about largely by extending the system without commercial considerations to remote and insignificant places to serve the interest of the comparatively limited number of people who use the telegraph, at the expense of all, and that if the same policy were pursued in this country, which is 25 times as large and not nearly so thickly populated, the same result would follow in an intensified degree.

In reply to this comment by Mr. Clark, Prof. Parsons states (Digest, CCXIII) that while there is a deficit in the operation of the English telegraph system, a deficit has not occurred in any of the other European countries, and it is believed that this condition was brought about by the mixing of the telegraph with the postal funds in such a way that a proper accounting of the respective expenses could not be made; that telegraph experts in England have stated that if such a division of the mail and telegraph expenses were made, there would be no deficit. Moreover, that the railroads in England are permitted to use the telegraph free, which is a mistake. Prof. Parsons says that the English telegraph system is run as a means of disseminating information throughout the whole country and giving increased facilities of communication to all classes, as well as a means of increasing the trade and commerce of the Kingdom.

(Digest, CCXIV), Prof. Parsons states that he believes that under the Constitution of the United States, it is the duty of the Federal Government to establish a postal-telegraph system. He quotes from a report of the House Committee on the Post Office and Post Roads of the Twenty-eighth Congress, wherein it was asserted that the telegraph came under the same category as the post office as a governmental function. The Government is bound to supply the people with means of communication. The Postal Service was placed under the control of the National Government and with the increase of inventions and other means of communication they likewise should be administered by the General Government.

Mr. Roberts, a member of the International Typographical Union telegraph committee, does not think it necessary to argue the question of the right of the Government to own and operate the telegraph. He states that—

"The operation of the Post Office Department is the best evidence that the Government has the right; if it has the right to transport letters, it certainly has the right to handle telegrams. In 1866 the Western Union Telegraph Co. practically conceded this right to the Government, merely asking that Congress should permit it to operate the system for the term of at least five years, in order that the capital invested in the plant might not be destroyed."

(Digest, CCXIV), Mr. Hitchcock says that it is the duty of the Government under the Constitution to utilize the best available means for the transmission of correspondence, and it is therefore unconstitutional for the telegraph to be operated as a private monopoly. Of 75 countries the telegraph is owned and operated by the Government in all except Bolivia, Cuba, Cyprus, Hawaii, Honduras, and the United States.

Mr. Randall says that his general reason for advocating governmental ownership of the telegraph is his opposition to a monopoly of any sort; that the press rates are extortionate; large dividends are paid on watered stock (two-thirds of the Western Union being watered); and he believes that the taking over of the the telegraph lines by the Government would merely be a return to original conditions, inasmuch as the first telegraph in America (from Washington to Baltimore) was built with an appropriation from Congress and was operated by the Post Office Department for three years.

(Digest, CCXIV), Prof. Parsons states "that when the English Government began to consider the absorption of the telegraph companies they used every effort to prevent the reform, and made all sorts of objections, every one of which has been answered by the results of the public system. There is really no force in the current objections to Government ownership aside from the patronage question, and that difficulty can be solved.

Mr. Hitchcock says (Digest, CCXV) "that a select committee of Congress in 1870 estimated that the annual saving by Government ownership of the telegraph would be at least $1,500,000. Inasmuch as the receipts of the telegraph company are now (for 1900) four times what they were in 1870, the saving under the Government operation would be very much greater now, even if there were no improvements made in operation. By cutting off dividends upon watered stock alone the saving by Government management would probably be not less than $4,000,000 per annum."

Mr. Chandler, of the Postal Telegraph Co., knows of no reason why the Government might not conduct the telegraph business and believes it would be practicable to introduce the telegraph into many country post offices and have both the mail service and the telegraph service operated by the same force, with a considerable saving in expenses.

Mr. Clark believes that there would be no advantage in Government ownership of the telegraph and does not think it practicable to use post-office employees as operators; that the Government could not make a more just division of rates than now exists, and that an extension of the telegraph to very small towns would prove unprofitable.

Mr. A. L. Randall (Digest, CCXVI) states that in 1893 the International Typographical Union of North America, at its forty-first annual session, held in Chicago, first advocated governmental ownership and control of the telegraph in resolutions offered by himself; and that a committee was appointed at this meeting to organize the country and in a short time petitions and resolutions bearing the signatures of 300,000 people came up to Congress and were referred to the House Committee on the Post Office and Post Roads which in 1894 accorded a hearing, at which the American Federation of Labor and other interests were represented. With only a few exceptions members of that committee and other Members of Congress admitted that it was not only the right, but the duty, of the Government to furnish the speediest and most efficient Postal Service possible, and that the telegraph is a necessary adjunct to the Postal Service. Mr. Randall says further that almost every Postmaster General since 1846 has been in favor of governmental ownership of the telegraph and names some of them.

(Digest, CCXVII), Mr. Roberts states that the International Typographical Union of 35,000 members, and at its annual meeting in 1893 put itself on record as favoring governmental ownership of the telegraph, and this union has a permanent committee on this subject. He stated further that the American Federation of Labor was on record as favoring this reform.

Mr. Chandler thinks that in case the Government should take over the properties of the telegraph companies it should appraise the same, which exists in the form of contracts, franchises, and privileges, at a fair value; that great care would have to be taken, and time, for the change.

Mr. Hitchcock believes that the purchase of the properties of the existing telegraph companies by the Government would be inexpedient because the Government would be called on to pay many times the actual value of the plant; that the simplest course for the Government to pursue would be to enter into an agreement with the owners of some improved system, such as the Delany system, for the latter to construct the first line and operate it for six months or a year for their own profit at 10 and 15 cent rates for 50 and 100 word messages. If at the end of that time the plant is working satisfactorily, the Government should then be obliged to take over the line, paying an advance of 10 per cent on the cost of construction. He does not believe that the competition thus engendered would result in ruin to the Western Union Co., because there would be time for a natural readjustment to meet the changed conditions.

(Digest, CCXVIII, CCXIX, and CCXX), Mr. Roberts, Mr. Randall, and Mr. Hitchcock allege that the existing telegraph companies exert a news monopoly in favor of certain newspapers, and Mr. Clark denies the allegation.

(Digest, CCXX and CCXXI), Prof. Parsons and Mr. Roberts allege an influence of the telegraph company in politics by reason of the furnishing of franks to Government officials; Mr. Clark and Mr. Chandler refute this statement, saying that such franks are furnished merely as a matter of courtesy.

(Digest, CCXXI, CCXXII), Mr. Randall and Mr. Roberts state that the Western Union Co. suppresses inventions which tend to cheapen and quicken the service, and Mr. Clark denies the charge. Prof. Parsons also makes the same charge, as does Mr. Romyn Hitchcock.

Mr. Chandler states that the Postal Telegraph Co. has endeavored to use new and useful devices to the fullest extent. A great many so-called improvements, however, when brought into actual practice in comparison with appliances already existing, have been found wanting.

Mr. Randall describes a system of telegraphy invented by a gentleman named Anderson, and known as the Anderson Machine Telegraph, which he alleges was suppressed by the Western Union Co.

Mr. Hitchcok advocates Government ownership, making use of the improvements in telegraphy made by Patrick B. Delany, and furnishes a description of his invention (Digest, CCXXIII).

(Digest, CCXXIV and CCXXV), Prof. Parsons and Mr. Roberts accuse the Western Union of paying its employees poor wages and of grinding them down. Mr. Clark denies this, and states that the wages paid operators by the Western Union range from $100 per month down according to the skill of the operator. Mr. Chandler states that the Postal Telegraph Co. pays its employees from $85 to $25 a month, according to their ability; that the average monthly salary is about $60. Nine hours is counted a day's labor and 7 hours a night's labor.

POSTAL ACT OF 1901.

The postal act of January 22, 1901, contained the following provision:

> The Postmaster General is directed, if he has sufficient available information to enable him to do so, to report to Congress the probable cost of connecting a telegraph and telephone system with the postal service by some feasible plan.

This direction of Congress does not appear to have been complied with.

REPORTS OF POSTMASTERS GENERAL PAYNE, CORTELYOU, AND HITCHCOCK.

The treatment accorded to the subjects of postal telegraph and postal telephones in the annual reports of Postmasters General Payne, Cortelyou, and Hitchcock are as follows:

> The extension of the rural free-delivery service and the consequent increase in the use of the mails by the patrons residing along the rural routes, together with the extension of the telephone service into the farming districts of the country, has suggested the propriety of extending the privilege of the special delivery of such letters, or the contents thereof, by means of the telephone, it being proposed that a special stamp be provided covering the cost of such transmission, the use of which stamp would authorize the postmaster at the office of delivery to open such letter and telephone its contents to the person to whom it is addressed. It will be seen that if such plan is feasible, 24 hours' time will be saved in the transmission of important messages to many people residing along the lines of the rural-delivery routes. I would recommend that a small appropriation be made by Congress for the purpose of enabling the Postmaster General to investigate this subject. (Annual report of Postmaster General Payne for the fiscal year ended June 30, 1903.)

> Progress toward these improvements will open the way for investigations to determine the feasibility of the adoption of many important policies of administration—reduction of postage, both domestic and international, postal savings banks, parcel post, postal telegraph and telephone, and others—the merits and defects of all of which should have in the not distant future the fullest consideration. (Annual report of Postmaster General Cortelyou for the fiscal year 1906.)

> "The telegraph lines in the United States should be made a part of the postal service and operated in conjunction with the mail service. Such a consolidation would unquestionably result in important economies and permit the adoption of lower telegraph rates. Post offices are maintained in numerous places not reached by the telegraph systems, and the proposed consolidation would therefore afford a favorable opportunity for the wide extension of telegraph facilities. In many small towns where the telegraph companies have offices the telegraph and mail business could be readily handled by the same employees. The separate maintenance of the two services under present conditions results in a needless expense. In practically all the European countries, including Great Britain, Germany, France, Russia, Austria, and Italy, the telegraph is being operated under Government control as a part of the postal system. As a matter of fact, the first telegraph in the United States was also operated for several years, from 1844 to 1847, by the Government under authority from Congress, and there seems to be good ground why the Government control should be resumed. A method has already been prescribed for taking over the telegraph lines by section 5267 of the Revised Statutes, which provides that the Government may, for postal, military, or other purposes, purchase telegraph lines operating in the United States at an appraised value. It is hoped that appropriate legislation will be enacted in harmony with this law providing for the taking over by the Government of the existing telegraph systems at terms that shall be fair to their present owners. Every reason for the transmission of intelligence by mail under Government control can be urged with equal force for a similar transmission of telegraphic communications. Because of the more extensive organization maintained by the postal service and the freedom from taxation and other charges to which a private corporation is subject, the Government undoubtedly will be able to afford greater telegraphic facilities at lower rates to the people than the companies now conducting this business. Next to the introduction of a parcel post, for which there is already a strong popular demand, the establishment of a Government telegraph system offers the best opportunity for the profitable extension of our postal business." (Annual report of Postmaster General Hitchcock for the fiscal year 1911.)

REPORT OF POSTMASTER GENERAL BURLESON: 1913.

Postmaster General Burleson has included in the Annual Report of the Postmaster General for the fiscal year ended June 30, 1913, the following statement:

> A study of the constitutional purposes of the postal establishment leads to the conviction that the Post Office Department should have control over all means of the communication of intelligence. The first telegraph line in this country was maintained and operated as a part of the postal service, and it is to be regretted that Congress saw fit to relinquish this facility to private enterprise. The monopolistic nature of the telegraph business makes it of vital importance to the people that it be conducted by unselfish interests, and this can be accomplished only through Government ownership.
>
> The act of July 24, 1866, providing for the Government acquisition of the telegraph lines upon payment of an appraised valuation, and the act of 1902 directing the Postmaster General "to report to Congress the probable cost of connecting a telegraph and telephone system with the postal service by some feasible plan" are evidences of the policy of this Government ultimately to acquire and operate these electrical means of communication as postal facilities, as is done by all the principal nations, the United States alone excepted.
>
> The successful operation of the parcel post has demonstrated the capacity of the Government to conduct the public utilities which fall properly within the postal provision of the Constitution.

Every argument in favor of the Government ownership of telegraph lines may be advanced with equal logic and force in favor of the Government ownership of telephone lines. It has been competently decided that a telephone message and a telegram are the same within the meaning of the laws governing the telegraph service, and therefore it is believed that the statute enabling the Government to acquire, upon the payment of an appraised valuation, the telegraph lines of the country, will enable the Government to acquire the telephonic network of the country. While it is true that the telephone companies have not complied with the requirements of section 5267, Revised Statutes, this can not be held to nullify the intent of the law, since the nonperformance on the part of the Government of any of its constitutional privileges in nowise surrenders the right to exercise these privileges whenever the best interests of the Nation demand.

Since June last the department has been conducting a careful investigation to determine the desirability and practicability of extending the Government ownership and control of means of communication, with a view to the acquisition by the Government of the telegraph and telephone facilities, to be operated as an adjunct to the postal service. The Postmaster General is now engaged in reviewing the data collected, and later, if desired, will submit same to the appropriate committees of Congress for their consideration.

PRESENT SITUATION.

Government ownership of the electrical means of transmitting intelligence is brought to the attention of the American people of 1913 with the indorsement of nearly every Postmaster General since the Civil War, with a score of favorable reports by committees of Congress, and by the example of practically every other nation of the civilized world. More than 70 bills have been introduced in Congress to accomplish it. Meanwhile the private operation of the telegraphic and telephonic facilities has resulted in a virtual monopoly by which the people are annually taxed vast sums for which they receive no adequate return.

APPENDIX B.

STATE LEGISLATIVE ACTION RELATIVE TO TELEPHONE AND TELEGRAPH SERVICE.

Many States have established commissions for the regulation of telephone, telegraph, and other public service companies. Some of the legislation in those States is set forth here as evidence of the general dissatisfaction with these services on the part of the people. The problems dealt with in this legislation so far as they concern telegraph and telephone service would be finally solved by Government ownership of the electrical means of communication.

[Excerpts from "Commission Regulation of Public Utilities," compiled by the National Civic Federation, 1913, and other sources.]

PHYSICAL CONNECTION OF TELEPHONE AND TELEGRAPH COMPANIES.

[Paragraph numbers refer to "Commission Regulation of Public Utilities."]

ARIZONA—CALIFORNIA.

1185. Whenever commission, after a hearing had upon its own motion or upon complaint, shall find that a physical connection can reasonably be made between the lines of two or more telephone corporations or two or more telegraph corporations whose lines can be made to form a continuous line of communication by the construction and maintenance of suitable connections for the transfer of messages or conversations, and that public convenience and necessity will be subserved thereby, or shall find that two or more telegraph or telephone corporations have failed to establish joint rates, tolls, or charges for service by or over their said lines, and that joint rates, tolls, or charges ought to be established, commission may, by its order, require that such connection be made, except where the purpose of such connection is primarily to secure the transmission of local messages or conversations between points within the same city, or town (include "city and county" in California), and that conversations be transmitted and messages transferred over such connections under such rules and regulations as commission may establish and prescribe through lines and joint rates, tolls, and charges to be made and to be used, observed, and in force in the future. (Ariz.—Sess. Laws 1912, ch. 90, sec. 40; Cal.—Stats. 1911, ch. 14, sec. 40.)

1186. If such telephone or telegraph corporations do not agree upon the division between them of the cost of such physical connection or connections or the division of the joint rates, tolls, or charges established by commission over such through lines, commission shall have authority, after further hearing, to establish such division by supplemental order. (Same.)

KENTUCKY.

1187. Any association or corporation or the lessees or managers thereof, organized for the purpose, or any individual, shall have the right to construct and maintain lines of telegraph within this State and to connect the same with other lines, and said companies shall receive and transmit each other's messages without unreasonable delay or discrimination, and all such companies are hereby declared to be common carriers and subject to legislative control. Telephone companies operating exchanges in different towns or cities, or other public stations, shall receive and transmit each other's messages without unreasonable delay or discrimination. The general assembly shall, by general laws of uniform operation, provide reasonable regulations, to give full effect to this section. Nothing herein shall be construed to interfere with the rights of cities or towns to arrange and control their streets and alleys and to designate the places at which, and the manner in which, the wires of such companies shall be erected or laid within the limits of such city or town. (Const., sec. 199.)

MICHIGAN.

1188. Whenever application shall be made to commission by any party in interest to order the physical connection of any local telephone exchange, operated by any person, copartnership, or corporation, with the local telephone exchange operated by any other person, partnership, or corporation, in the same city or village, commission shall give due notice to the respective persons, copartnerships, or corporations owning such telephone exchanges of a hearing to be had upon such application; and, after such hearing and such other investigation made either by itself or its servants and agents, said commission shall determine, by its order duly made and entered upon its records, whether or not such physical connection is required by the public necessity or convenience in the case brought before it by such application. If commission shall decide that such connection is so required, the telephone companies affected by such order shall furnish and maintain all reasonable and proper facilities for the interchange of service between their respective exchanges affected by such order, including all necessary trunk lines, switchboards, wires, aerial or cable, crossarms, poles, or other fixtures; all necessary construction, maintenance, and equipment to be built and maintained in such manner, under such rules, and with such division of expense and labor as shall or may be required or provided by commission. Every telephone corporation affected by such order is hereby required to perform switching service for any other telephone corporation similarly affected by connecting its lines temporarily with the lines of the other telephone corporation, providing for the direct transmission of messages between subscribers, and shall request the connection of its lines with the lines of the other telephone corporation on request of any of its subscribers. Any telephone corporation which is required to perform switching service for another telephone corporation under the terms of such an order may demand and receive as compensation for such service the sum of 5 cents per message in addition to the regular service charge, if any. The telephone corporation on whose line or lines messages originate shall be responsible to and make settlement with the terminal companies performing the switching service for it on its request and may demand and receive from its subscribers a fee of 5 cents per message in addition to the regular service charge if any for all messages sent by it to other telephone companies on request of such subscribers in accordance with the provisions of this act. Whenever a subscriber of any telephone company affected by such order of commission desires to talk with a subscriber of another telephone corporation so affected, who is connected with an exchange other than that in the city, village, or township in which the message originates, the switching service between the companies shall be done at whatever point may be designated by commission. The company at whose exchange messages of this kind originate may demand and receive from its subscribers the charge for switching service as provided above in addition to the regular toll charges of the companies over whose line or lines or affiliated line or lines the messages are sent; and the division of commissions and toll charges shall be made between the companies in such proportion as said commission may designate: *Provided*, That the provisions of this section in regard to switching charges shall not apply when two or more competing companies in any locality shall merge or consolidate their property and business in such locality under the direction of said commission, or when one competing company shall sell or lease its plant, property, and business to another company in the same locality, such merger, consolidation, sale, or lease, if with the approval of commission, being hereby declared lawful. Commission may make all such reasonable rules or orders as may be reasonable or necessary to carry out the intent of the provisions of this section, and refusal to obey such rules, orders, or provisions of this section shall be unlawful. (Pub. Acts 1911, No. 138, sec. 6.)

NEW MEXICO.

1189. All telephone and telegraph lines, operated for hire, shall receive and transmit each other's messages without delay or discrimination, and make and maintain connections with each other's lines, under such rules and regulations as may be prescribed by commission. (Const., Art. XI, sec. 16.)

NEW YORK.

1190. Commission may, by order, require any two or more telegraph corporations whose lines form a continuous line of communication or could be made to do so by the construction and maintenance of suitable connections or transfer of messages at common points between different localities which are not reached by the line of either company alone, to establish through lines between two or more such localities and joint rates or charges for service by or over said lines as commission may, by its order, prescribe. (Laws 1910, ch. 480, sec. 97 (3).)

1191. In case such through lines and joint rates be not established by the corporations named in any such order within the time therein specified, commission may, by order, establish the same and fix the just and reasonable rates and charges to be charged for such through service and declare the portion thereof to which each of the corporations affected thereby shall be entitled and the manner in which the same shall be secured and paid. (Same.)

OHIO.

1192. Commission may, upon complaint in writing by any person or on its own initiative by order, require two or more telephone companies whose lines or wires form a continuous line of communication or could be made to do so by the construction and maintenance of suitable connections or the joint use of equipment or the transfer of messages at common points between different localities which can not be communicated with or reached by the lines of either company alone, where such service is not already established or provided for unless public necessity requires additional service, to establish and maintain through lines within the State between two or more such localities. (Laws 1911, No. 325, sec. 66.)

1193. The joint rate or charges for such service shall be just and reasonable and commission may establish the same and declare the portion thereof to which each company affected thereby shall be entitled and the manner in which the same shall be secured and paid. (Same.)

1194. All necessary construction, maintenance, and equipment in order to establish such service, shall be constructed and maintained in such manner and under such rules with such divisions of expense and labor as shall or may be required by commission. (Same.)

OKLAHOMA.

1195. All telephone and telegraph lines operated for hire shall each, respectively, receive and transmit each other's messages without delay or discrimination, and make physical connection with each other's lines, under such rules and regulations as shall be prescribed by law, or by any commission created by this constitution or act of the legislature for that purpose. (Const., Art. IX, sec. 5.)

SOUTH CAROLINA.

1196. Commission shall require reasonable connections to be made and maintained, when practicable, between lines, stations, or exchanges for the transmission of intelligence for hire and fix and regulate reasonable rates, tolls, or compensation therefor, and also require reasonable connections to be made and maintained, when practicable, between any such lines, stations or exchanges, and the lines or stations of private individuals, firms, or corporations desiring such connections. (Laws 1904, No. 281, sec. 1.)

SOUTH DAKOTA.

1197. Every telephone company shall connect its lines with the lines of any other telephone company doing business in the same vicinity that makes application therefor, and shall afford all reasonable and proper facilities for the interchange and switching of messages between lines, for a reasonable compensation and without discrimination, and under such rules and regulations as commission may prescribe: *Provided*, That messages originating on any line shall have preference over messages originating on competing lines: *Provided*, That the maximum charges for switching shall not exceed 25 cents per month for each instrument on any rural party line so connected. (Sess. Laws 1909, ch. 289, sec. 8.)

1198. Commission shall have jurisdiction to compel the connection of different telephone lines in the State of South Dakota. Any telephone company desiring its lines to connect with any other company's lines or exchange shall, whenever such connection shall be refused, make application to commission: *Provided, however*, That when any telephone line shall be constructed to the corporate limits of any city, town, or village, and shall be denied the privilege to construct its telephone line within such corporate limits, commission may, in its discretion, compel the construction of such connections by such company or companies interested therein, and the expense of such construction and connection shall be borne by the companies interested, in such manner as commission shall determine. Upon receipt of such application commission shall ascertain the facts in the case, and if, in their judgment, the public service demands said connection, and the lines of the applicant are in proper condition, said commission shall order such connections to be made, and shall apportion the expense thereof: *Provided, however*, That no wire shall be compelled to connect except at exchanges or station points. Nothing in this act shall be construed to prevent any telephone company from connecting its line or lines with any other telephone company's line or lines by mutual consent. (Sess. Laws 1911, ch. 218, sec. 5.)

WASHINGTON.

1199. Whenever commission shall find that any two or more telephone companies whose lines form a continuous line of communication or could be made to do so by the construction and maintenance of suitable connections for the transfer of messages or conversations at common points between different localities which are not reached by the line of either company alone and that such connections or facilities for the transfer of messages or conversations at common points can reasonably be made and efficient service obtained and that a necessity exists therefor, or shall find any two or more telegraph or telephone companies have failed to establish joint rates or charges for service by or over their said lines, and that joint rates or charges ought to be established, commission may by its order require such connections to be made and that conversations be transmitted and messages transferred and prescribed through lines and joint rates and charges to be made and to be used, observed, and in force in the future and fix the same by order to be served upon the company or companies affected. (Laws 1911, ch. 117, sec. 73.)

WISCONSIN.

1200. Every utility for the conveyance of telephone messages shall permit a physical connection or connections to be made, and telephone service to be furnished, between any telephone systems operated by it and the telephone toll line operated by another such public utility, or between its toll line and the telephone system of another such public utility, or between its telephone system and the telephone system of another such public utility, whenever the public convenience and necessity require such physical connection or connections, and such physical connection or connections will not result in irreparable injury to the owners or users of the facilities of such public utilities, nor in any substantial detriment to the service to be rendered by such public utilities. The term "physical connection," as used in this section, shall mean such number of trunk lines or complete wire circuits and connections as may be required to furnish reasonably adequate telephone service between such public utilities. (Laws 1907, ch. 499, sec. 1797m-4, as amended by Laws 1911, ch. 546.)

1201. In case of failure to agree upon such physical connection or connections or the terms and conditions upon which the same shall be made, any public utility or any person, association, or corporation interested may apply to commission, and if after investigation commission shall ascertain that public convenience and necessity require such physical connection or connections and that such physical connection would not result in irreparable injury to the owner or other users of the facilities of such public utilities nor in any substantial detriment to the service to be rendered by such public utilities or other users of such facilities, it shall by order direct that such physical connection or connections be made and determine how and within what time such connection or connections shall be made and by whom the expense of making and maintaining such connection or connections shall be paid. (Same.)

1202. Such physical connection or connections so ordered shall be made and such terms and conditions upon which such physical connection or connections shall be made so determined shall be the lawful terms and conditions upon which physical connection or connections shall be made, to be observed, followed, and paid, subject to recourse to the courts upon the complaint of any interested party. Any such order of commission may be from time to time revised by commission upon application of any interested party or upon its own motion. (Same.)

1203. Whenever two or more public utilities for the conveyance of telephone messages shall connect in furnishing joint telephone service to the public and shall be required to furnish such service as provided in section 1797m-4, and shall refuse or neglect to establish joint toll or tolls, commission may after notice and a public hearing, as provided in sections 1797m-44 and 1797m-45, fix and establish by order such joint toll or tolls. (Same, sec. 1797m-30 (2), as amended by Laws 1911, ch. 546.)

1204. If the public utilities party thereto shall fail to agree upon the apportionment thereof within 20 days after the service of such order, commission may upon a like hearing issue a supplemental order, declaring the apportionment of such joint toll or tolls and the same shall take effect of its own force as part of the original order. (Same.)

JOINT OR THROUGH SERVICE AND CHARGES THEREFOR.

LOUISIANA.

1108. Commission shall require all express, telegraph, and telephone companies or corporations upon the demand of any person or persons, firm, partnership, or corporation to adopt and make and thereafter when necessary to change reasonable and just joint through rates and charges for the carriage of express matter and the transmission of messages by telegraph and communications by telephone between points in the State: ***Provided,*** That nothing in this act shall be construed to mean that any telephone or telegraph company shall be required to connect its wires and apparatus with the wires or apparatus of any other telephone or telegraph company. (Stats. 1904, No. 24, sec. 2.)

1109. In the event of the failure of the railroads and other common carriers, express, telegraph, and telephone companies referred to in this act to establish reasonable joint through rates and charges for transportation of freight and express matter and the transmission of communications by telegraph and telephone, commission shall, upon the application of any person, firm, partnership, or corporation, adopt and make such reasonable and just rates and charges for the transportation of freight carried over the lines of two or more connecting railroads or other connecting common carriers or for the transportation over the lines of two or more connecting express companies or the transmission of communications over two or more connecting telephone or telegraph lines; and all such rates and charges thus adopted, made, and established by commission shall go into effect within 30 days after the same shall have been promulgated by publication in the official journal of commission and written or telegraphic notice given to such companies. (Same, sec. 3.)

1110. Before the promulgation of such rates and charges thus adopted by commission, said commission shall notify the railroad and other common carriers, express, telegraph, and telephone companies interested of the proposed schedule of joint through rates to be promulgated by commission and shall allow them 30 days thereafter to agree upon a division of the charges provided for in such schedule. If such companies or corporations fail to agree upon a division and notify commission thereof, it shall, after a hearing of the companies or corporations interested, decide the matter and determine how such division should be made. (Same, sec. 4.)

MISSISSIPPI.

1128. In fixing joint tariffs of rates for connecting lines, commission shall determine the proportion to be charged by each of the railroads or other common carriers. (Code 1906, sec. 4842.)

NEVADA.

1141. Commission may make just and reasonable regulations for the apportionment of all charges between two or more companies jointly engaged in the transportation of freight, passengers, express matter, telegraph or telephone messages. (Stats. 1907, ch. 44, sec. 7, as amended by Stats. 1909, ch. 121, sec. 3.)

Requirement that Utilities Serve Applicants.

MASSACHUSETTS.

2318. A person or corporation owning, controlling, or operating a telephone exchange or service in this Commonwealth shall, upon application of an individual or corporation and the tender of the charges or rental usual or customary for the class of service required, without discrimination for the same class of service rendered, furnish such individual or corporation with the use of a telephone and telephone service and connection with their respective exchanges and the subscribers thereto, if the applicant secures the rights necessary to make the connection applied for and pays to the telephone company in advance an amount sufficient to cover the actual cost of the extension, if said extension is more than 1 mile from any main exchange circuit of the said telephone company. (Acts 1906, ch. 433, sec. 13.)

VERMONT.

2326. A person or corporation owning, controlling, or operating a telephone exchange or service, on application of a person or corporation and tender of the charges of rental sum usual or customary for the class of service required, without discrimination for the same class of service rendered, shall furnish the person or corporation so applying with the use of a telephone and telephonic service and connection with their respective changes and subscribers thereto: *Provided*, That such person or corporation secures the rights necessary to make the connections applied for and pays the telephone company in advance a sufficient sum to cover the actual cost of the extension, if such extension is beyond 1 mile from a main exchange circuit of such telephone company. (Pub. Stats. 1906, sec. 4872.)

Telephone Companies Required to Serve Telegraph Companies.

CONNECTICUT, MASSACHUSETTS.

2336. Every person or corporation owning, controlling, or operating a telephone exchange or service shall, on application of any telegraph company, furnish such company with the use of a telephone or telephones and telephone service and connection with their respective exchanges and the subscribers thereto, without discrimination between telegraph companies as to such connections, service, or use of instruments furnished, or charges therefor, for the same class of service. (Conn. Gen. Stats. 1902, sec. 3915; Mass. Rev. Laws 1902, ch. 122, sec. 12.)

Railroad, Express, and Telegraph Companies Required to Have Telephone Facilities.

KANSAS.

2346. Commission may require and compel the furnishing of such service. Upon complaint to commission that any telephonic service with any railroad, telegraph, or express company's buildings, offices, or grounds is inadequate or in any respect unreasonably or unjustly discriminatory or that such service can not be had, commission shall investigate the same; and if upon investigation commission shall find that any telephonic service is inadequate or unreasonably or unjustly discriminatory or that such service can not be had, it shall determine and by order fix a reasonable regulation, practice, or service to be.installed, observed, and operated in the future. Laws 1911, ch. 136, sec. 2.)

2347. Any common carrier which shall fail to comply with the order of commission in respect thereto shall be deemed guilty of a misdemeanor and upon conviction in any court having jurisdiction thereof shall be fined for each offense a sum not less than $100 nor more than $500 within the discretion of the court. (Same, sec. 3.)

NEBRASKA.

2348. Provisions identical with paragraphs 2346, above, (Cobbey's Annotated Statutes, 1909, sections 10665 x 5, 10665 x 6.)

2349. Any common carrier which shall fail to comply with the order of commission in respect thereto shall be deemed guilty of misdemeanor, and upon conviction in any court having jurisdiction thereof shall be fined for each offense a sum not less than $100 nor more than $500 or be imprisoned in the county jail not less than 10 days nor more than 30 days or both within the discretion of the court. (Same, sec. 10665 x 7.)

NORTH DAKOTA.

2350. Every railroad corporation or common carrier shall provide, furnish, and maintain in all of their freight and ticket offices in all towns, cities, and villages in this

State, where there is a local telephone exchange and where such service is available, reasonable and adequate telephone connections for the use and benefit of its patrons. (Laws 1911, ch. 252, sec. 1.)

2351. Any railroad corporation or common carrier violating the provisions of this act shall be fined not less than $100 nor more than $200 for each offense, and it shall be the duty of the State's attorney upon orders from commission or upon complaint of any citizen to commence and prosecute all actions necessary for the enforcement of this act. (Same, sec. 2.)

VERMONT.

2352. Every railroad corporation shall grant to every person, firm, joint stock company, or corporation operating a public telephone line in the State and having at least 500 telephone connections equal and reasonable terms, arrangements, and facilities for the installation of telephone instruments on the lines, or connected with the telephone system of such person, firm, joint stock company, or corporation, in all depots, station houses, or offices of such railroad corporation in the State. A railroad corporation that violates the provisions of this section shall be fined not more than $1,000 and shall be further liable in an action on this statute for damages to the party injured thereby; but the provisions of this section shall not apply to street railways. (Pub. Stats. 1906, sec. 4489.)

VIRGINIA.

2353. Every railroad company having a ticket office or freight office in any city or town where there are at the time one or more public telephone exchanges, or at any place where telephone connection may be had, on reasonably moderate terms, with one or more telephone exchanges not more than 25 miles distant from such place shall constantly maintain in each of such offices direct telephone connection with each of such exchanges. (Laws 1906, ch. 298, sec. 1.)

2354. Nothing herein contained shall be construed to require such railroad company to build a telephone line, it being intended to require such company to put telephones in its offices where it can obtain them as they may be obtained for other business offices in the same vicinity; such railroad company shall cause to be promptly answered all calls made over such telephone connections during business hours. (Same.)

2355. Through such telephone connection, such railroad company shall cause prompt and correct replies to be made to all reasonable and proper inquiries received over such connection during business hours concerning the passenger or freight service of such road. (Same.)

WISCONSIN.

2356. Every railroad company shall furnish reasonably adequate telephonic connection with its offices, buildings, and grounds. (Laws 1907, ch. 614, sec. 1797 g-1.)

2357. Upon complaint to commission that any telephonic service with any railroad is inadequate or in any respect unreasonably or unjustly discriminatory or that such service can not be had, commission shall investigate the same; and if upon investigation commission shall find that any telephonic service is inadequate or unreasonably or unjustly discriminatory or that such service can not be had, it shall determine and by order fix a reasonable regulation, practice, or service to be installed, imposed, observed, and followed in the future. (Same, sec. 1797 g-2.)

MISCELLANEOUS.

COLORADO (SESSION LAWS, 1913—TO BE SUBMITTED BY REFERENDUM).

SEC. 27. Whenever the commission, after a hearing had upon its own motion or upon complaint, shall find that a physical connection can reasonably be made between the lines of two or more noncompetitive telegraph or telephone corporations whose lines can be made to form a continuous line of communication by the construction and maintenance of suitable connections for the transmission of messages or conversations, and the public convenience and necessity will be subserved thereby, or shall find that two or more telegraph or telephone corporations have failed to establish joint rates, tolls, or charges for service by or over their said lines, and that joint rates, tolls, or charges ought to be established, the commission may by its order require that such connections be made, except where the purpose of such connection is primarily to secure the transmission of local messages or conversations between points in the same consolidated city and county, city or town, and that conversations be transmitted and messages transferred over such connection under such rules and regulations as the commission may establish and prescribe through lines and joint rates, tolls, and charges to be made, and to be used, observed, and in force in the future. If such telephone or telegraph corporations do not agree upon the division between them of the joint cost of such physical connection or connections or the division of the joint rates, tolls, or charges established by the commission over such through lines, the commission shall have authority, after further hearing, to establish such division by supplemental order.

SEC. 28. Whenever the commission, after a hearing had upon its own motion or upon complaint of a public utility affected, shall find that the public convenience and necessity require the use by one public utility of the conduits, subways, tracks, wires, poles, pipes, or other equipment, or any part thereof, on, over, or under any street or highway, and belonging to another public utility, and that such use will not result in irreparable injury to the owner or other users of such conduits, subways, wires, tracks, poles, pipes, or other equipment or in any substantial detriment to the service, and that such public utilities have failed to agree upon such use or the terms and conditions or compensation for the same, the commission may by order direct that such use be permitted, and prescribe reasonable compensation and reasonable terms and conditions for the joint use. If such use be directed, the public utility to whom the use is permitted shall be liable to the owner or other users of such conduits, subways, tracks, wires, poles, pipes, or other equipment for such damage as may result therefrom to the property of such owners or other users thereof: *Provided*, That power companies shall not be permitted to use telegraph or telephone conduits or poles for transmission of electric current.

IDAHO.

House bill No. 21 provides that—

SEC. 38. Whenever the commission, after a hearing had upon its own motion or upon complaint, shall find that a physical connection can reasonably be made between the lines of two or more telephone corporations or two or more telegraph corporations whose lines can be made to form a continuous line of communication by the construction and maintenance of suitable connections for the transfer of messages or conversations, and that public convenience or necessity will be subserved thereby, or shall find that two or more telegraph or telephone corporations have failed to establish joint rates, tolls, or charges for service by or over their said lines, and that joint rates, tolls, or charges ought to be established, the commission may, by its order, require that such connections be made, and that conversations be transmitted and messages transferred over such connection under such rules and regulations as the commission may establish, and prescribe through lines and joint rates, tolls, and charges to be made, and to be used, observed, and in force in the future. If such telephone or telegraph corporations do not agree upon the division between them of the cost of said physical connections or connections of the division of the joint rates, tolls, or charges established by the commission over such through lines, the commission shall have authority, after further hearing, to establish such division by supplementary order.

Sec. 39. Whenever the commission, after a hearing had upon its own motion or upon complaint of a public utility affected, shall find that public convenience and necessity require the use of one public utility of the conduits, subways, tracks, wire, poles, pipes, or other equipment, or any part thereof, on, over, or under any street or highway, and belonging to another public utility, and that such use will not result in irreparable injury to the owner or other users of such conduits, subways, tracks, wires, poles, pipes, or other equipment or in any substantial detriment to the service, and that such public utilities have failed to agree upon such use or the terms and conditions or compensation for the same, the commission may by order direct that such use be permitted and prescribe a reasonable compensation and reasonable terms and conditions for the joint use. If such use be directed, the public utility to whom the use is permitted shall be liable to the owner, or other users of such conduits, subways, tracks, wires, poles, pipes, or other equipment for such damage as may result therefrom to the property of such owner or other users thereof.

ILLINOIS (PUBLIC UTILITIES COMMISSION LAW, ACT OF 1913.

Sec. 47. *Telephone and telegraph connections.*—Whenever the commission, after a hearing had upon its own motion or upon complaint, shall determine that public convenience and necessity require a physical connection for the establishment of a continuous line of communication between any two or more public utilities for the conveyance of messages or conversations, the commission may, by order, require that such connection be made. If such public utilities do not agree upon the division between them of the cost of such physical connection or connections the commission shall have authority, after further hearings, to establish such division by supplemental order.

Sec. 48. *Joint use of facilities.*—Whenever the commission, after a hearing had upon its own motion or upon complaint, shall find that public convenience and necessity require the use of one public utility of the conduits, subways, tracks, wires, poles, pipes, or other property or equipment, or any part thereof, on, over, or under any street or highway belonging to another public utility, and that such use will not prevent the owner or other users thereof from performing their public duties nor result in irreparable injury to such owner or other users of such conduits, subways, tracks, wires, poles, pipes, or other property or equipment, or in any substantial detriment to the service, and that such public utilities have failed to agree upon such use or the terms and conditions or compensation for the same, the commission may, by order, direct that such use be permitted and prescribe a reasonable compensation and reasonable terms and conditions for such joint use. If such use be directed, the public utility to whom the use is permitted shall be liable to the owner or other users of such conduits, subways, tracks, wires, poles, pipes, or other property or equipment, for such damage as may result therefrom to the property of such owner or other users thereof: *Provided*, That nothing in this section shall be construed to extend the jurisdiction of the commission over the joint us of such facilities of public utilities mainly or primarily within a city and subject to the jurisdiction of such city.

MAINE.

The measure reported to the Senate on March 7, 1913, to be referred to the people for a referendum vote, provides that—

Sec. 39. Whenever the commission, after a hearing had upon its own motion or upon complaint, shall find that a physical connection can reasonably be made between the lines of two or more telephone companies or two or more telegraph companies, whose lines can be made to form a continuous line of communication, by the construction and maintenance of suitable connections, for the transfer of messages or conversations, and that public convenience and necessity will be subserved thereby, or shall find that two or more telegraph or telephone companies have failed to establish joint rates, tolls, or charges for service by or over their said lines, and that joint rates, tolls, or charges for service by or over their said lines, and that joint rates, tolls, or charges ought to be established, the commission may, by its order, require that such connection be made, except where the purpose of such connection is primarily to secure the transmission of local messages or conversations between points within the same city or town, and that conversations be transmitted and messages transferred over such connection under such rules and regulations as the commission may establish, and prescribe through lines and joint rates, tolls, and charges to be made, and to be used, observed, and enforced in the future. If such telephone or telegraph companies do not agree upon the division between them of the cost of such physical connection or connections or the division of the joint rates, tolls, or charges established by the commission over such through lines, the commission shall have authority, after further hearing, to establish such division by supplemental order.

Sec. 40. Whenever the commission, after a hearing had upon its own motion or upon complaint of a public utility affected, shall find that public convenience and necessity require the use by one public utility of the conduits, subways, tracks, wires, poles, pipes, or other equipment, or any part thereof, on, over, or under any street or highway, and belonging to another public utility, and that such use will not result in irreparable injury to the owner or other users of such conduits, subways, tracks, wires, poles, pipes, or other equipment, or in any substantial detriment to the service, and that such public utilities have failed to agree upon such use of the terms and conditions or compensation for the same, the commission may by order direct that such use be permitted, and prescribe a reasonable compensation and reasonable terms and conditions for the joint use. If such use be directed, the public utility to whom the use is permitted shall be liable to the owner or other users of such conduits, subways, tracks, wires, poles, pipes, or other equipment for such damages as may result therefrom to the property of such owner or other users thereof.

MISSOURI (PUBLIC SERVICE COMMISSION LAW, 1913).

SEC. 93, par. 3. Whenever the commission, after a hearing had upon its own motion or upon complaint, shall find that a physical connection can reasonably be made between the lines of two or more telephone corporations or two or more telegraph corporations whose lines can be made to form a continuous line of communication by the construction and maintenance of suitable connections for the transfer of messages or conversations, and that public convenience and necessity will be subserved thereby, or shall find that two or more telegraph or telephone corporations have failed to establish joint rates, tolls, or charges for service by or over their said lines, and that joint rates, tolls, or charges ought to be established, the commission may, by its order, require that such connection be made, except where the purpose of such connection is primarily to secure the transmission of local messages or conversations between points within the same city or town, and the conversations be transmitted and messages transferred over such connection under such rules and regulations as the commission may establish and prescribe through lines and joint rates, tolls, and charges to be made, and to be used, observed, and in force in the future. If such telegraph or telephone corporations do not agree upon the division between them of the cost of such physical connection or connections or the division of the joint rates, tolls, or charges established by the commission over such through lines, the commission shall have authority, after further hearing, to establish such division by supplemental order.

PENNSYLVANIA (ACT APPROVED JULY 26, 1913).

ARTICLE II. Duties and Liabilities of Public Service Companies. Section I: It shall be the duty of every public service company—

* * * * * * *

(*u*) If a telegraph corporation, or person engaged in the public telegraph business, to connect, whenever the commission may require it or him so to do, its or his lines of telegraph with the lines of any other such telegraph corporation, or person engaged in the public telegraph business; and thereupon it shall be and become the reciprocal duty of each of such connecting telegraph corporations, or persons, upon the payment of the usual charges to individuals for transmitting dispatches, as established by the rates and regulations of such telegraph corporations, or persons, or by the commission as hereinafter provided, to receive and to transmit dispatches from and for each other with impartiality and good faith, and likewise for any individual or individuals.

(*v*) If a telephone corporation, or person engaged in the telephone business, whose lines, together with the lines of another telephone corporation, or person engaged in the telephone business, form a continuous line of communication, between different localities, which are not reached by lines, facilities, or connections of either alone, and could be made to do so by the construction and maintenance of suitable connections between the several lines at common points, for the transmission of conversations between different localities, to jointly arrange for the interchange and transfer of conversations at such common points when it can reasonably be done, and efficient service can be obtained without injustice to either company and without substantial impairment or detriment to the service to be rendered by either company, and when necessity exists therefor, in order to supply through traffic communication between different localities not otherwise provided for by the companies in question, or either of them; and shall operate and conduct a joint through traffic over the several lines so connected, and shall make the proper rules and regulations governing the same, and shall establish just and reasonable rates and charges for the joint through service thereby rendered, and shall make among themselves an equitable apportionment of the costs and revenues appertaining to the joint facilities and service.

A TENTATIVE DRAFT OF A BILL DECLARING A GOVERNMENT MONOPOLY OVER ELECTRICAL MEANS OF COMMUNICATION; AND PROVIDING FOR THE CONDEMNATION, ACQUISITION, AND OPERATION OF EXISTING TELEPHONE AND TELEGRAPH SYSTEMS; AND PROVIDING FOR THE MAKING OF APPRAISALS, AWARDS, AND PAYMENTS IN CONNECTION THEREWITH.

[With a view to securing valuable assistance and guidance in duly safeguarding the interests of the Government and of the owners of the properties affected, it is suggested that this tentative draft be referred to the leading authorities on public utilities. For the purpose of full discussion, the draft has been made to include the condemnation, acquisition, and purchase of the existing systems of both telephones and telegraphs.]

A BILL To secure to the United States a monopoly of electrical means for the transmission of intelligence for hire; to provide for the acquisition by the Post Office Department of the telegraph and telephone networks; and to license certain telephone lines, radio and telegraph agencies.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in order to promote the Postal Service the Postmaster General of the United States is hereby vested with a monopoly of the function and means of electrical communication for hire within the United States and the Territory of Alaska except as hereinafter provided.

SEC. 2. The telephone and telegraph systems and networks within the United States and the Territory of Alaska employed in the transmission of communications for hire, and such as may be necessary of the central-office equipment, underground cable, underground conduit, aërial cable, aerial wire, poles, building cable, subscribers' stations, including indoor wiring and drops to premises of subscribers, private branch-exchange switchboards, land, buildings, furniture and fixtures, tools and teams, stores and supplies, and all other property used in the telegraph and telephone service and appropriate and necessary for the operation of the same by the United States, are hereby declared to be, and the same are hereby, condemned and appropriated to and for the use of the United States of America, to be used by it for such public purposes as may be proper: *Provided,* That this section shall not apply to telephone lines known as farmer lines.

SEC. 3. That it shall be the duty of the Postmaster General, and he is hereby empowered and directed, on the first day of July, nineteen hundred and fourteen, to take charge and possession, in the name of, for, and by the authority of the United States of America, of all long-distance telephone lines, and of such interurban toll telephone lines connecting therewith, condemned in section two, as he may deem advisable. He is further empowered and directed to take charge and possession, immediately or within a reasonable time, of the telegraph and the remaining telephone properties condemned in section two of this act, in their entirety or by operating units or divisions or such part thereof as he may deem wise; and it shall be the duty of the Postmaster General to use the properties and facilities of which he has taken possession in conjunction with the Postal Service for the transmission of telegrams, messages, correspondence, and communications under such rates and regulations as he may prescribe in order to promote the usefulness of the service to the public and to insure the receipt of revenue adequate to pay the cost of such service, including depreciation and a sinking-fund charge of one per centum per annum on the aggregate amount of the bonds issued for said properties and interest on the bonds which may be issued therefor. The Postmaster General is hereby authorized during the fiscal years nineteen hundred and fifteen, nineteen hundred and sixteen, and nineteen hundred and seventeen to use so much of the revenue arising from the telephone and telegraph business as may be necessary to employ persons to operate the service, to pay rents, the costs of maintenance, and such other expenses as may be essential in the conduct of the service, and shall render a report in detail of such expenditures to Congress at the beginning of each regular session thereof.

The positions of all employees engaged in operating the service under this act shall be within the classified civil service of the United States, but any employee who remains in the service after the properties are acquired by the Post Office Department shall not be given a classified status until he establishes, under rules and regulations to be prescribed by the Civil Service Commission and to the satisfaction of the Postmaster General, his capacity for efficient service.

SEC. 4. That immediately after the passage of this act it shall be the duty of the Interstate Commerce Commission to proceed to appraise the values of the properties condemned and appropriated by section 2 of this act, such appraisals of the parts to be made in the order in which the Postmaster General elects to take them over and award to the respective owners thereof just compensation therefor, and said Interstate Commerce Commission shall, as soon as possible, file an inventory of the physical assets in use and useful in conducting such service and the values of the same, proper allowance being made for depreciation. Each Commissioner of Interstate Commerce shall make oath before a judge of a court of the United States to faithfully perform such duty, and each person employed by said commission for such purpose shall make oath before one of said commissioners to report to such commission all facts and circumstances connected with the determination of the values of such properties. The said Interstate Commerce Commission shall have power, and it shall be its duty, to summon witnesses with books and papers before it for either of the parties, and to require such witnesses to testify, and it shall give to each party a full hearing on the compensation to be awarded; and it shall be the duty of said commission to file a separate award of appraisal for each distinct ownership of such condemned properties, and give notice of the filing of such award to the Postmaster General and the owner thereof. It shall be the further duty of the Interstate Commerce Commission to prescribe such methods of keeping records and accounts as may be necessary to determine the changes, by improvements and extensions and depreciation in the conditions of the properties appraised and changes in the values thereof between the date of the original appraisals and that of taking possession by the Postmaster General, if any such interval there be, which differences in values, if any, shall be added to or deducted from such original awards. And if either party be dissatisfied with the amount of such award it may, on appeal by either party, be reviewed by the Circuit Court of Appeals of the United States having jurisdiction where the owner has its principal office, which Circuit Court of Appeals is hereby vested with jurisdiction for such purpose; and an appeal may similarly be taken from such Circuit Court of Appeals to the Supreme Court of the United States for a final review of the amount of the award. Such final award shall bear interest at the rate of four per centum per annum from the date the Postmaster General shall have taken possession of the property until the date of its final payment, which interest may be paid quarterly to the owners pendente lite on such principal sum as may, for that purpose, be agreed upon between the Postmaster General and the owner; the excesses or shortages, if any, of payments of interest, as determined by the amount of the final award, to be credited or debited thereto as the award may finally warrant.

SEC. 5. That the Secretary of the Treasury is hereby authorized and directed to make payment to such telegraph and telephone owners of the money adjudged to be due them by said awards as aforesaid out of the Treasury of the United States, and said telegraph and telephone owners shall be entitled to payment of such awards as compensation from the Treasury of the United States after the Postmaster General takes possession of the property valued in said awards, and the amounts of said awards are hereby appropriated to the parties entitled thereto out of the Treasury of the United States.

SEC. 6. That the Secretary of the Treasury shall cause to be issued from time to time in the proper form bonds of the United States of America in denominations of $20 or multiple thereof in such sum or sums as may be necessary to make payment of such awards, and also from time to time, as necessity requires, bonds to the maximum sum of $70,000,000, to be used by the Postmaster General for extensions and improvements of the telegraph and telephone service and to provide for the reimbursement of the depreciation reserves for funds advanced for extensions. Such bonds shall be exempt from all taxes or duties levied by the United States or any State, county, or local governing body, and the interest thereon shall be paid quarterly. All citizens shall have an equal opportunity to subscribe therefor, and a sum not exceeding one-tenth of one per centum of such bonds, or so much thereof as may be necessary, is hereby appropriated out of the Treasury to defray the cost of preparing, advertising, and issuing the same. Said bonds shall be payable within fifty years from the date of issue and shall bear interest at the rate of 3 per centum per annum, and the Secretary of the Treasury shall maintain a fund for the payment of such interest and for the redemption of the bonds issued under this act; and for such purposes the Postmaster General shall pay quarterly out of the receipts of such service into the Treasury of the United States a sum equal to such interest and a redemption charge equal to 1 per centum per annum of the aggregate awards. The said sinking fund shall be invested from time to time in such securities as the Secretary of the Treasury may deem secure and profitable. The sum of $1,000,000, or so much thereof as may be necessary, is hereby appropriated out of any money in the Treasury not otherwise appropriated, $500,000 of which sum may be used by the Post Office Department and a like sum by the Department of Justice in order to defray the expenses incurred by these departments incident to acquiring such properties.

SEC. 7. That as the values of the telegraph and telephone properties shall be determined the Postmaster General shall annually set aside out of the gross receipts of the telephone and telegraph business a sum not to exceed 10 per centum of the value of such telephone and telegraph properties owned by the United States as a depreciation fund which he may invest and expend to extend and develop such systems of electrical communication, and the Postmaster General may lease, purchase, or condemn in the name of the United States such property as may be necessary therefor, including, by agreement, "farmer lines." He may also confer the privilege by license on any State, county, municipality, company, association, or individual, under such regulations and conditions as he may prescribe, to construct and operate telegraph or telephone lines as well as telephone exchanges and radio stations, or he may require that the same be operated by the Post Office Department, but he shall stipulate in said license the right of purchase by the United States.

SEC. 8. That the existing telegraph companies which have accepted the provisions of the act of Congress of the twenty-fourth day of July, eighteen hundred and sixty-six, are hereby licensed to do a telegraphic business, subject to the act to regulate commerce between the several States, until they are acquired. The lines of telegraph or telephone which are now or hereafter may be used in connection with the operation of any railroad are hereby licensed to do an exclusively railroad business; and the existing "farmer lines" and radio and wireless stations are hereby licensed to do a telephone and radio business, subject to the provisions of existing laws. And the owners of the telephone properties condemned in section two of this act are also hereby licensed to continue the business in which they are engaged until said properties are taken possession of by the Postmaster General under section three of this act.

SEC. 9. Whoever shall construct and operate any telephone or telegraph line for the conveyance of messages or communications for hire without first securing from the Postmaster General a license so to do in accordance with section seven of this act shall be fined not less than $1,000, or imprisoned not less than one year, or both.

Whoever shall wilfully interfere with the operation of any telephone or telegraph line operated by the Post Office Department or with the transmission of any telephone or telegraph message over lines operated by the Post Office Department or with the delivery of any such message, or whoever being employed by the Post Office Department shall divulge the contents of any such telephone or telegraph message to any person not authorized to receive the same shall be fined not exceeding $1,000, or imprisoned not less than one year, or both.

All statutes relating to offenses against the property belonging to or in use by the Post Office Department, or the embezzlement, conversion, improper handling, unlawful retention, use, or disposal of postal or money-order funds, and to offenses against the mails, and the punishment provided for such offenses are hereby made applicable to the telephone and telegraph and radio service operated by the Post Office Department.

All acts or parts of acts inconsistent herewith are hereby repealed.

[REGULATION OF RADIO BY THE DEPARTMENT OF COMMERCE,

Washington, D. C., 1909-1932]

SELECTIONS FROM
REPORT OF THE
SECRETARY OF COMMERCE AND LABOR

1909-1912

Selection from

REPORTS

OF THE

DEPARTMENT OF COMMERCE AND LABOR

1909

REPORT OF THE SECRETARY OF COMMERCE AND LABOR

AND

REPORTS OF BUREAUS

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WIRELESS APPARATUS ON PASSENGER SHIPS.

At the last session of the Sixtieth Congress a bill passed the House of Representatives requiring radio-telegraphic installations on all sea-going passenger ships, American or foreign, carrying 50 passengers or more, departing from American ports in the foreign trade or coastwise trade on voyages by sea between ports more than 200 miles distant. The bill reached the Senate too late for consideration. Similar bills have been introduced in the Senate and House of Representatives of the Sixty-first Congress, and the passage of such a measure is recommended. With the commercial phases of wireless telegraphy the Bureau is not concerned. Evidently the chances of success of a wireless telegraph company, as of a telephone company on shore, increase with the number of its stations. The present principal use of wireless telegraphy is as a means of communication between ship and shore or vice versa. Consequently wireless telegraph corporations have the keenest interest in supplying their apparatus to ships on which there is a likelihood of its use by passengers. While there are charges for the installation of the plant on shipboard, there is reason to believe that these charges are moderate, especially in the case of ships with a large cabin passenger list.

In the past two years wireless telegraphy has repeatedly demonstrated its value as an instrument to promote the safety of life and property at sea. Instances of its effective use for this purpose are so generally known that argument based upon them is unnecessary. Its value, in fact, is such that marine underwriters are considering the question whether the presence of the apparatus on board should not lead to a material reduction in marine insurance premiums. The use of wireless telegraphy at sea has already become so general that little or no hardship would be involved in a statute requiring all vessels of the kind designated to be equipped. During the first six months of the current calendar year 282 ocean steamers carried steerage passengers to the United States under the provisions of the passenger act of 1882. Of that number, 143, aggregating 1,593,000 gross tons, were equipped with wireless apparatus, and 139, aggregating only 646,000 gross tons, were not so equipped. A list of those ships may be found in Appendix M.[a] The ships equipped, taken together, had a capacity of 174,000 passengers, of whom 27,000 were cabin passengers and 147,000 steerage passengers. These ships embraced nearly all of the largest and highest class passenger ships in trans-Atlantic trade. The ships not so equipped had a capacity of 61,000 passengers, of whom 6,000 were cabin passengers and 55,000 were steerage passengers. Generally speaking, these ships were the older and slower ships, especially devoted to certain branches of the trans-Atlantic steerage or immigrant trade. From the point of view of safety to life it is quite as important that such ships should be as well equipped as ships more particularly employed in the cabin passenger trade. Of course the commercial receipts of a wireless station on board an immigrant ship would be relatively small, and such an installation should be classed purely as a safety appliance. The situation on our coastwise American ocean passenger steamers is quite similar. Of 167 such steamers, carrying 50 passengers or more on routes at sea between ports 200 miles or more distant, 97, of 376,000 gross tons, were equipped with radio-telegraphic apparatus, and 70, of 145,000 gross tons, were not so equipped. The vessels equipped have a passenger capacity of 32,000; those not equipped of 18,000. In the coastwise trade the distinction between cabin and steerage passengers is not prescribed by statute. A law requiring all passenger ships of the type mentioned to be equipped with apparatus for radio-communication accordingly would, in effect, adopt as a statutory standard of responsibility for safety to life a standard already voluntarily adopted by the owners of two-thirds of the tonnage, American and foreign, in the ocean passenger trade of the United States.

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[a] Not printed in this volume. See note on page 459.

Through the liberality of Congress the Navy Department has established, as a measure of national defense, a comprehensive system of wireless shore stations at principal points on our Atlantic, Pacific, and Gulf coasts, on the Isthmus, in Porto Rico, Alaska, Hawaii, and the Philippines. The War Department has its stations and the several wireless corporations have also numerous shore stations. The transmission of wireless messages between San Francisco and Hawaii has been effected readily. By exchanging messages from ship to ship, vessels crossing the Atlantic are now in constant touch with the shores of America and England. On one occasion the American S. S. *Minnesota*, crossing the Pacific, is reported to have been in daily communication with the land, and the *Korea* has been reported as in simultaneous communication with American and Asiatic coasts. Congress already, accordingly, through the well-directed energies of the War and Navy departments, has done very much to render practicable communication with the shore from a ship almost anywhere within 300 miles of our coasts. Since the adjournment of Congress the British Government has purchased the wireless shore stations on the coasts of the United Kingdom, so that reasonable communication for ships with that side of the Atlantic is assured. Indeed, so rapidly is wireless telegraphy being accepted as a national necessity that even the extensive coasts of Brazil, under the auspices of its Government, are being equipped with wireless stations, though the sea-borne commerce passing those coasts is small by comparison with that of the North Atlantic.

There are several systems of wireless telegraphy in more or less general use. If Congress shall conclude to prescribe wireless installations on passenger ships, evidently the compulsory interchange of messages relating to the safety of the ship and to essential facts of navigation should be required as a condition to the acceptance of any apparatus. Such compulsory interchange of all messages was provided for in the Berlin radio-telegraphic convention of 1906, which is awaiting action by the Senate. The objections made to that treaty by interested parties would not apply to the suggestion just made. Wireless telephony has made progress.

The matter of the regulation by statute of the tolls to be charged for messages relating to safety or the price or rentals of installations on shipboard involves a discussion of the general policy of the fixing of rates and prices by legislation or administrative agencies which will not be looked for in this report.

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WIRELESS ON SHIPS.

By the act of July 24, 1910, Congress has provided that on and after July 1, 1911, every ocean-going passenger steamer carrying 50 or more persons for a voyage of 200 miles or more between ports must be equipped with efficient wireless apparatus and a skilled operator, the apparatus to be capable of transmitting and receiving messages at least 100 nautical miles by night or day. This act is a useful measure for the promotion of the safety of life and property at sea and the adoption of a similar measure by other maritime nations is doubtless a matter of but a short time.

Appendix M[a] contains a statement of the vessels to be subject to the law which are already equipped to meet its requirements and of those not yet equipped. The statements contained therein are based on the reports of collectors of customs on September 1, 1910, but of course by July 1, 1911, the situation will have materially changed. The statements show that 370 ocean passenger steamers are already equipped with wireless apparatus and that 185 are not yet so equipped. The act also prescribes that companies installing wireless apparatus shall contract in writing to exchange and shall in fact exchange messages with shore or ship stations using other systems of radio-communication. By this provision of the law Congress has taken an important step toward the enforcement of the principal article of the Berlin Wireless Convention of 1906. The two companies which have equipped 313 of the 370 vessels have already begun to provide in their contracts for a complete compliance with this requirement of the statute. In fact, on the part of both shipowners and the wireless companies, the disposition has been manifested in advance to comply with the law and to cooperate with the Department in securing its efficient enforcement.

The act prescribes that the Secretary of Commerce and Labor shall make such regulations as may be necessary to secure the proper execution of the law. With a view to the preparation of such regulations, the Bureau has been in correspondence with the wireless companies and with steamship owners so that the regulations may be prepared in ample time to be fully known and understood before the act takes effect, on the 1st of July.

There seems to be no reason to apprehend that there will be a lack of skilled wireless operators, and enough companies are prepared to furnish the necessary installations to lead to the conclusion that monopoly and extortionate rates will not result from the act.

To enforce the law a small appropriation will be necessary, and the Department estimates accordingly carry an item of $10,000 for this purpose. Of the 555 vessels required to be equipped, 320 clear from New York, and it will be necessary accordingly to have at least one wireless inspector, and probably two, stationed at that port. Men competent to perform this work can not be obtained at a salary less than $1,500. Possibly the work at other North Atlantic ports can be performed by one inspector, but an allowance must be made for traveling expenses in that event. The same situation applies to ports on the Gulf of Mexico and on the Pacific coast. A small amount may also be required for testing apparatus, so that the sum of $10,000 seems to be the least amount for which the work can be performed during the first year.

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[a] Not printed in this volume. See note on page 603.

WIRELESS REGULATION.

While the Congress of the United States is the first legislative body to require the installation of wireless apparatus on ocean passenger ships, other nations are in advance of the United States in the other essential matter of the regulation of radio-communication. A bill for the regulation of radio-communication, however (S. 7243), passed the Senate on June 17, 1910, and a bill similar in all essential respects (H. R. 23595) was reported favorably to the House at the last session and holds an advanced place on the calendar. The House bill differs from the bill which passed the Senate in only one considerable matter, viz, it prescribes license fees for wireless stations, and this requirement may well be omitted. The bill was drawn after careful consultation of representatives of the Treasury Department, the War Department, the Navy Department, and the Department of Commerce and Labor, and has been cordially approved by those departments. The reasons for the passage of the bill are fully set forth in Senate Report No. 659, and House Report No. 924, Sixty-first Congress, second session, and its passage is earnestly recommended.

The bill is drawn to avoid the difficulties which have hitherto stood in the way of the ratification by the United States of the Berlin Wireless Convention of 1906, which has met the approval of practically all other maritime nations.

While the act of June 18, 1910, to create a commerce court, brings wireless companies within the scope of the interstate-commerce act, the Bureau understands that only the charges of wireless companies are covered by that act, and the desirability of the passage of the bill referred to is not for this reason lessened.

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WIRELESS-SHIP ACT.

During the last quarter of the fiscal year preparations were made for the enforcement of the wireless-ship act of June 24, 1910. The essential section of that act provides:

> From and after the first day of July, nineteen hundred and eleven, it shall be unlawful for any ocean-going steamer of the United States, or of any foreign country, carrying passengers and carrying fifty or more persons, including passengers and crew, to leave or attempt to leave any port of the United States unless such steamer shall be equipped with an efficient apparatus for radio-communication, in good working order, in charge of a person skilled in the use of such apparatus, which apparatus shall be capable of transmitting and receiving messages over a distance of at least one hundred miles, night or day: *Provided*, That the provisions of this Act shall not apply to steamers plying only between ports less than two hundred miles apart.

Three wireless-ship inspectors were selected from the classified service on the basis of practical experience in telegraphy, knowledge of electricity and wireless apparatus, and administrative ability. The three inspectors were then sent to the Bureau of Standards for a course of further technical training, and they began active work, respectively, at New York on July 3, at San Francisco on July 8, and at Baltimore on July 21.

During the three months ended September 30 they made 524 personal inspections of the wireless apparatus on steamships subject to the act, visiting for the purpose the following additional ports: Boston, Savannah, Charleston, S. C., Brunswick, Ga., Jacksonville, Key West, Tampa, Mobile, New Orleans, Galveston, Portland, Oreg., Tacoma, Seattle, and Port Townsend.

The inspections have covered the various details of wireless apparatus on shipboard. An idea of their scope may be formed from brief extracts from inspectors' reports in Appendix M.[1] Besides these details the inspectors have also examined ships' operators, advised officers of customs, masters of vessels, and wireless operators, and performed the usual amount of extra work required in the administration of a new law, for which procedure, methods and forms have to be established. In most respects the three months' work has been well done; the steamship companies and the wireless companies concerned, with slight exceptions, have cooperated willingly in the enforcement of the law, and have commended its enactment and administration; masters of vessels, especially in a position to appreciate the usefulness of wireless apparatus, have welcomed the inspection as an aid in securing efficient apparatus and skilled operators.

SCOPE OF APPLICATION.

On September 1, 1910, before the act took effect, collectors of customs reported that 370 ocean passenger steamships departing from ports of the United States were equipped with wireless apparatus. Appendix M[1] shows that at the present time 488 such ocean passenger steamships subject to the act are now equipped with wireless apparatus. Lloyd's Register this year records 1,013 vessels equipped with wireless throughout the world. The increase is not wholly due to the law, for some shipowners would have continued the practice already voluntarily begun of thus equipping their vessels. In other instances, however, the equipment has been in obedience to law. Besides the vessels equipped under the act of 1910, there are already in the United States 142 vessels, including 15 yachts, voluntarily equipped with wireless. Economies in dispatch, in securing pilots, and loading berths, as well as the demands of the public traveling by sea on small steamers, have impelled owners to incur the expense involved in equipment. Thus far the marine insurance companies have not specifically made a distinct difference in marine rates on hulls and cargoes on account of wireless, but the subject has been under consideration by insurance companies and underwriters and the time doubtless is not remote when part at least of the expense of equipment will be offset by recognition in insurance rates. The fact that a vessel at sea which can communicate at will with other vessels or shore stations hundreds of miles distant is in less risk of total or heavy loss than one out of touch with the rest of the world is not now entirely ignored in insurance. Doubtless the newness and imperfections of the apparatus and uncertainty as to the skill of operators have retarded recognition. Inspection under the wireless-ship act ought to aid in securing thoroughly efficient apparatus and competent operators. At this time it is more desirable to aim at these results than to extend the scope of the act, and to secure a thorough understanding and enforcement of the law as it stands rather than to increase the classes of vessels on which wireless installations are obligatory. A year or two of actual experience under the present law and of observation of the normal increase in the use of the apparatus will furnish safe guides for future legislation.

The efficiency of wireless apparatus and the skill of operators on shipboard concerns the wireless company which leases the apparatus and furnishes the operator, and also concerns the steamship, its owner and master, on which apparatus is installed and the operator is employed. To the inquiry, then, whether Government supervision be needed in addition to that prompted by self-interest, it may be replied that it has been deemed necessary as well as humane both here and abroad to provide for Government inspection of the hulls, boilers, machinery, and equipment of vessels and to examine the qualifications of their officers, in the interest of the safety of life of those on board. The same reasons prompt Federal inspection of wireless apparatus, and there are other reasons. The seaworthiness of a vessel, in the main, concerns only those on board of that particular vessel. Sound boilers and adequate fire pumps protect the lives on board the ship equipped with them. Efficient wireless apparatus and skilled operators not only protect the lives of passengers on board ships, where they are employed, but insure prompt aid in peril to those on board of other steamships. The mutual usefulness of wireless apparatus in time of danger to two or more steamships or to a shore station affords a special reason for Government inspection. In fact, the general equipment of ocean passenger steamships with wireless apparatus takes its place, and at insignificant cost to the Government, among the several services which Congress maintains with liberal appropriations for the safety of life and property on the water.

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[1] Not printed in this volume. See note on p. 699.

APPROPRIATIONS.

Congress at the last session made the following appropriation to the Bureau:

> Wireless communication: To enable the Secretary of Commerce and Labor to enforce the Act approved June twenty-fourth, nineteen hundred and ten, entitled "An Act to require apparatus and operators for radio-communication on certain ocean steamers;" and to employ such persons and means as may be necessary, seven thousand dollars.

The Department requested in its estimates an appropriation of $10,000, and that request is renewed in this year's estimates. That estimate was based on the belief that there should be four wireless-ship inspectors—one for New York and New England, one for Atlantic ports from New York to Florida, one for Gulf ports, and one for Pacific ports. With the reduced appropriation, however, it was possible to provide only three inspectors—one for New York and New England, one for the Pacific, and one for other Atlantic and Gulf ports.

The amount of work required is larger, probably, than is generally understood. During July, 1911, the first month of the operation of the act, the total departures of vessels subject to the act were 1,163, and during the year will certainly exceed 10,000. The departures from New York numbered 244; from Boston, 144; Providence, R. I., 13; Portland, Me., 3; and Belfast, 2; or 406 in all. During the winter months the number will be somewhat less for some lines, but will increase by the transfer to Portland of trans-Atlantic steamers from the St. Lawrence. The work of this district is all that one inspector can perform, and it is important work. The Pacific coast must be a separate district. During July departures of ships subject to the wireless act numbered from San Francisco, 92; San Diego, 22; Los Angeles, 113; Eureka, 18; Portland, Oreg., 22; Port Townsend, 54;

Juneau, Alaska, 32; and Honolulu, 14; in all, 367. If the appropriation permits, the Pacific coast inspector will make a trip to Alaska or Hawaii in the spring. The appropriation should be large enough to allow at least one inspection at the ports of each Territory every year. During July the departures from remaining Atlantic and Gulf ports were Philadelphia, 37; Baltimore, 41; Newport News, 1; Norfolk, 57; Charleston, S. C., 37; Savannah, 48; Brunswick, Ga., 16; Jacksonville, 32; Key West, 27; Mobile, 5; New Orleans, 26; Galveston, 11; and San Juan, P. R., 52; in all, 390. On the average, a dozen steamers subject to the act depart daily from the ports of this district, and if those ports were close together any inspection worth making would require all the time of a competent man. In fact, from Philadelphia to Galveston by sea is 1,840 miles, and from Key West, nearest port to Porto Rico, to San Juan is 972 miles. The district is altogether too large for one inspector. Porto Rico will be visited if the appropriation permits.

Of the current appropriation of $7,000, the sum of $5,400 has been allotted for salaries for the three inspectors at the rate of $1,980, $1,800, and $1,620, respectively, based in July on the number of wireless ships at that time in each district. Competent men to enforce a new law could not be obtained for less, and salaries have been more than earned during the first quarter of the operation of the act. The balance of $1,600 has been set apart for traveling expenses and incidentals. With only three inspectors for the entire seaboard, these must necessarily be large, especially as at least one annual inspection should be made at Porto Rico, Hawaii, and Alaska, respectively.

Each inspector must be provided with certain testing and measuring instruments. While the cost is not large, it was more than the appropriation permitted, and the Bureau was compelled to borrow sets of instruments (wave meter, ammeter, and head telephone) from the Bureau of Standards. Each set costs $265, and the appropriation should allow the purchase of four sets ($1,060). A small sum is needed for the occasional purchase of technical books and minor incidentals. After three months' experience, the Bureau is confident that a satisfactory inspection system can be maintained next year with the appropriation of $10,000 requested. With a less amount, it must be given up at some ports and be merely superficial at some others.

VIOLATIONS OF THE ACT.

The wireless-ship act was approved on June 24, 1910, to take effect on July 1, 1911, so that a year was allowed for ocean passenger steamships and the wireless companies to arrange for compliance with its provisions. The act has been generally commended, and with very few exceptions all those affected by its provisions have willingly complied with its requirements and have cooperated with the Department in securing a satisfactory enforcement of the law. In case of violation the act does not authorize refusal of clearance but specifically provides for the imposition upon the master of a fine of not more than $5,000, in the discretion of the court. Collectors of customs were instructed, accordingly, to report to the proper United States attorney any case of violation of the law in their districts, respectively. Three such cases have been so reported and are awaiting the action of the court. On July 3 the American Mail steamship *Zulia* cleared from Mayaguez, P. R., for New York, with a crew of 53 men and 31 passengers, without wireless apparatus or operator. The parts of the apparatus were on board but had not been assembled and put in working order, and there was no operator. The owners stated that they did not suppose Mayaguez was a port of the United States, and that they expected to put the apparatus in commission and secure a qualified operator on arrival in New York, as was done on July 12. The company gave a bond for $5,000, and the case will be tried before the United States district court for Porto Rico.

On July 21 the American steamship *Lexington* departed from Savannah for Philadelphia without a wireless operator. Savannah was a port of call and the operator left the ship for a trolley trip of a few hours, and did not return to the wharf until the ship had departed. His absence was not discovered until the *Lexington* was well down the river. The case is in the hands of the United States attorney. It has had its effect, as in another instance an American steamship returned to port for the wireless operator whose absence had not been observed by the master until the ship was 10 miles out at sea.

On July 21 the British steamship *Templemore* cleared from Baltimore for Liverpool with a crew nominally of 75 men. The *Templemore* is ordinarily a cargo steamer, not equipped with wireless. On this voyage four well-known residents of the city, not connected in any manner, so far as ascertained, with the ship or her cargo, were entered on the ship's articles as members of the crew at a shilling a month. The master was advised by customs officers that he would carry such men at his risk, and if the court held that they were in fact passengers, though nominally members of the crew, he would be liable to a heavy fine. The Federal grand jury indicted the master on October 13, and the case awaits trial.

Generally there has been no disposition to evade or violate the law. In several cases where the crew and passengers numbered 50 or more and the ship was not equipped, the excess over 49 were compelled to go ashore and take another vessel. Where apparatus has been found defective by the Department's inspectors, masters have detained their vessels until the defects have been remedied and the apparatus has been rendered efficient.

DISTANCE TESTS.

The act prescribes that the apparatus "shall be capable of transmitting and receiving messages over a distance of at least one hundred miles, night or day." To determine the radius of apparatus as far as practicable by the time the act took effect on July 1, 1911, an arrangement was made with the steamship and wireless companies, rendered possible through the courtesy of the Navy Department, by which during the months of May and June the naval wireless stations along the seaboard received from 8 a. m. to 6 p. m. daily preliminary test messages from ships at sea. Tests by day are more severe than by night. Messages from 373 ships have been received, and where less than the required distance was covered, the fact was brought to the ship's notice. The Navy Department has consented to continue these practical tests through the current fiscal year. Ammeters also enable the wireless inspectors to determine the radius of action of apparatus.

INTERCHANGEABILITY.

The second section of the act provides:

> SEC. 2. That for the purpose of this Act apparatus for radio-communication shall not be deemed to be efficient unless the company installing it shall contract in writing to exchange, and shall, in fact, exchange, as far as may be physically practicable, to be determined by the master of the vessel, messages with shore or ship stations using other systems of radio-communication.

This section was taken substantially from article 3 of the Berlin Radiotelegraphic Convention of 1906, reading:

> ART. 3. The coastal stations and the stations on shipboard shall be bound to exchange wireless telegrams without distinction of the wireless telegraph system adopted by such stations.

The purpose of the Berlin article was to forestall any attempt to establish an international monopoly in control of wireless telegraphy, and incidentally to increase the extent of the usefulness of each wireless installation. These purposes are also served by section 2 of the wireless-ship act.

Section 2 of the act enables the master of the ship to determine the extent to which exchange may be physically practicable. The need of such a limit was shown at the time of the loss of the steamship *Republic*, when unnecessary personal shore calls threatened interference with necessary distress signals from the ship and waste of the ship's limited and diminishing storage power. Section 2 of the act has been complied with so far as the Bureau and its inspectors can ascertain. Complaint, if any, of its violation will receive prompt attention, but a willful violation is not probable, because it would involve rejection of the apparatus and subject the master to the penalty for failure to carry efficient apparatus. The United Wireless Co., which has equipped 438 vessels (including about 200 not subject to the act), and does a much larger business than any other company with vessels subject to the act, began before July 1 and now continues to include in its contracts the following provision:

> The parties hereto agree to exchange messages with shore and ship stations using other systems of radio-communication in accordance with the provisions of an act of Congress entitled "An Act to require apparatus and operators for radio-communication on certain ocean steamers," approved June 24, 1910.

Following is an example of the agreement made by the Massie company, which has equipped 17 American vessels:

MARINE TRANSMISSION CO.,
(OPERATING THE MASSIE WIRELESS TELEGRAPH SYSTEM),
Providence, R. I., March 4, 1911.

SAN FRANCISCO & PORTLAND STEAMSHIP CO.,
San Francisco, Cal.

GENTLEMEN: We are pleased to advise that the wireless installed on your steamer *Rose City* complies with all the terms and conditions specified in section 2 of the act of June 24, 1910, relative to wireless equipment of passenger vessels, and we hereby agree to comply with the terms and conditions of the above-mentioned law in relation to exchanging of messages with other systems and wireless companies.

Very truly, yours,

WALTER W. MASSIE,
President and General Manager.

Foreign ships and wireless companies were already bound to exchange messages by the Berlin convention quoted. The Marconi company, however, has also entered into separate engagements with the various lines of steamships which it equips, of which the following is an example:

> THE MARCONI INTERNATIONAL MARINE COMMUNICATION CO. (LTD.),
> WATERGATE HOUSE, YORK BUILDINGS,
> *Adelphi, London, W. C., August 18, 1910.*
>
> THE CUNARD STEAMSHIP CO. (LTD.),
> *8 Water Street, Liverpool.*
>
> DEAR SIRS: In conformity with section (2) of the U. S. A. bill, S. 7021, approved by the President on June 24, 1910, being "An Act to require apparatus and operators for radio-communication on certain ocean steamers," we hereby undertake, as far as concerns our installations on board your vessels, to comply with the provisions of the above mentioned section (2) as on and after July 1, 1911, when that act is to take effect.
>
> This undertaking however is given without prejudice to our rights under the patent laws, and our communicating with installations which are an infringement of our patents must not be deemed an act of condonation on our part.
>
> Yours faithfully,
>
> THE MARCONI INTERNATIONAL MARINE COMMUNICATION CO. (LTD.),
> W. W. BRADFIELD,
> *Deputy Manager.*

The Marconi company has equipped 167 steamships subject to the act. The German Telefunken Co., which has equipped 57 ships subject to the act is bound by the Berlin convention, as is the Japanese Government, which itself installs the apparatus on Japanese trans-Pacific passenger steamships and furnishes the operators, who remain in Government service.

It is the custom of the wireless companies to lease the apparatus and to supply and pay the operator, and section 2 of the act was framed to meet this custom. The National Electric Signaling (Fessenden) Co., however, has sold outright the apparatus for several steamships of the United Fruit Co., and technically the law does not meet this situation. Such cases will necessarily be rare and offer no practical difficulty, as the United Fruit Co. has raised no objections to the Bureau's suggestion that it interchange messages with other systems and has made working arrangements for interchange with the companies named above and has instructed its operators to comply with them. The wireless-ship inspectors are in daily contact with wireless operators, and are thus in a position to report promptly any unwarranted failure or refusal to exchange messages.

WIRELESS-SHIP OPERATORS.

The act prescribed that the wireless installation on shipboard should be "in charge of a person skilled in the use of such apparatus," and bestowed upon the Secretary of Commerce and Labor power to make regulations to secure the execution of this and other provisions of the law. Correspondence with the wireless companies and with representatives of steamship companies subject to the act corroborated the Department's opinion that the simplest and most thorough method of securing the employment of skilled operators was to provide for Government examinations and the issue of Government certificates of skill in radiocommunication, similar to the licenses issued to the masters, mates, and pilots of steamboats. The Berlin Radiotelegraphic Convention of 1906, to which practically all nations except the United States have adhered, provides in the service regulations (VI, 3, 4) as follows:

> 3. The service of the station on shipboard shall be carried on by a telegraph operator holding a certificate issued by the government to which the vessel is subject. Such certificate shall attest the professional efficiency of the operator as regards:
>
> (c) Adjustment of the apparatus;
>
> (b) Transmission and acoustic reception at the rate of not less than 20 words a minute;
>
> (c) Knowledge of the regulations governing the exchange of wireless telegraph correspondence.
>
> 4. The certificate shall furthermore state that the government has bound the operator to secrecy with regard to the correspondence.

As more than half of the ocean passenger steamers subject to the act are under foreign flags, the Department, through the usual channels, notified foreign governments and on March 29 collectors of customs that wireless operators holding valid certificates issued by foreign governments which had ratified the Berlin convention would be recognized as persons skilled in the use of wireless apparatus, unless in specific cases there should be good reason to doubt the operator's skill and reliability. The foreign governments concerned readily adjusted themselves to this arrangement. Those nations which had not hitherto issued certificates to skilled operators arranged for their own government examinations—usually by their naval officers—and issued the necessary certificates. France, Italy, and Holland, with others, followed this course; Great Britain had already issued such certificates. So far as foreign ships are concerned, this regulation of the Department has worked satisfactorily.

The Berlin requirements were adopted substantially as the test of skill for American operators. The use of apparatus and the employment of operators under the Berlin convention is voluntary; the act of June 24, 1910, made both obligatory under heavy penalty in the case of certain ocean passenger steamers. At the outset, accordingly, it seemed best to require a speed of 15 words American Morse or 12 words Continental Morse in receiving and transmitting messages. By July, 1912, the speed requirement will be increased to the Berlin standard. Of course many certificated American operators already have such speed. The Continental or International Morse Code is used generally by foreign operators and is prescribed by the Berlin convention. It is also prescribed by the wireless regulations of the United States Navy. Experts are disposed to regard messages thus transmitted as less liable to error than by the American Morse Code, which is preferred by American operators generally because it permits of more rapid transmission. The Department's regulations, accordingly, permit the examination of operators in either code. In another year it is expected that American ship operators generally will have become proficient in the Continental Morse so as to take or receive messages in that code at the rate of 20 words a minute, five letters to the word.

The wireless operator's practical knowledge can be tested only at a set of apparatus, and the Department of Commerce and Labor lacked the machinery for such examinations. The Navy Department was consulted in April and consented to cooperate with this Department. Practical examinations of wireless-ship operators began in June and have been held from time to time since at the navy yards which are equipped with wireless apparatus and operators. These examinations by naval officers have covered the lines of knowledge already indicated, and have involved the actual use of apparatus of various systems, correction of faults, change from one wave length to another, and have tested the operator's ability to meet difficulties. The examinations will continue throughout the current year, and to the cooperation of the Navy Department is due in great measure the successful operation of the act of June 24, 1910. The Department's certificates of skill in radiocommunication have been issued to wireless-ship operators who have passed examinations at navy yards and naval stations, up to September 30, as follows:

Boston	46	Washington	13
Philadelphia	42	Puget Sound	39
New York	159	San Francisco	117
Norfolk	14	Honolulu	10
Charleston	3	Key West	3
San Juan	8		
New Orleans	23	Total	477

This Department's wireless-ship inspectors have examined and issued certificates to 30 operators, so in all 507 wireless-ship operators have passed practical Government examinations and received certificates of skill. Their names and addresses are filed with the Bureau. The certificates are valid for two years from the date of issue, subject to suspension or revocation by the Secretary of Commerce and Labor for cause. The form in use also provides for a certificate on the reverse as to the operator's services by the master of the steamship. Before a certificate is issued, the operator takes oath that he will faithfully preserve the secrecy of all messages coming to his knowledge through his employment under the certificate, and that he will well and faithfully discharge his duties. The wireless companies usually require their ship operators to give a bond that they will perform their duties faithfully, that they will report on board at times prescribed, and will not desert the ship. The wireless-ship operator both here and abroad is now reckoned one of the crew of the vessel, and it is the practice for him to sign the ship's articles with the officers and crew, thus fixing his legal status as a seaman, with the privileges and responsibilities which are attached. He is entitled to free marine-hospital relief, on the one hand, and on the other is subject to the discipline of the ship.

The work and pay compare favorably with the work and pay of railroad telegraph operators. In this part of the country railroad operators average from $50 to $60 a month, but begin service at about $40 a month. The wireless-ship operator in the United States usually begins with $30 a month, paid by the company, but in addition he receives his board and room from the ship; he is also frequently allowed by the company a percentage of the tolls on the commercial messages he receives and forwards.

The first three months' operation of the law have dispelled the fear that there might be a dearth of wireless-ship operators. Fully 600 operators have applied for Government examinations, and to prevent undue trespass on the courtesy of the Navy Department applications for examination thus far have been allowed only from wireless operators actually employed or from those seeking employment from a wireless or steamship company and presenting letters from such company. The field of examination ought soon to be enlarged. To enable those who live remote from the seaboard to secure certificates, the War Department has consented to cooperate by holding examinations at Fort Omaha, which is equipped with wireless apparatus in charge of officers of the Signal Corps.

WATCHES OF OPERATORS.

The usefulness of wireless apparatus on shipboard as a means of protecting life aboard and life aboard other ships depends, in the last analysis, on the vigilance of the wireless operator. If the operator be not at his post, distress calls from another ship will not be heard, and the benefit of radiocommunication will be lost. The best types of trans-Atlantic passenger steamships already carry two or more wireless operators, so that one operator is always on watch. It can not be expected, however, that the small passenger steamers subject to the wireless-ship act will carry more than one certificated operator. Early in the inspection provided by Congress it was noted that on some ships the operator was berthed at a distance from his apparatus and in some instances on a lower deck. The disadvantages of the arrangement are so plain that in most instances as soon as the Bureau's wireless-ship inspectors put the situation before the owners and masters of such steamships they shifted quarters so that the operator's berth should be within reach of his apparatus. No legal authority to compel such a change has been assumed, but the suggestion, when offered, has been rejected in only a few cases, and those usually of steamships which in other respects are inferior and just keep within other statutory requirements. The three wireless-ship inspectors have already done useful work, outside their statutory duties, in observing good features in the wireless arrangements of one ship and bringing such arrangements to the notice of masters of other ships. They are now consulting with shipowners as to the best means of meeting a situation, which undoubtedly exists in the passenger ships along the coast, that between the hours of midnight and 6 o'clock in the morning almost all the operators are asleep. Out of several methods of correction proposed a reasonable one will probably soon be selected or evolved.

CALL LETTERS.

The service regulations of the Berlin Radiotelegraphic Convention provide that every wireless ship or shore station shall have its own call letters (signifying its name), which must consist of three letters of the alphabet. To prevent duplication of call letters is one of the duties of the International Bureau of Telegraphs at Berne, Switzerland, which has charge of general administrative work in the interest of wireless telegraphy. Call letters for American ships equipped with wireless have been assigned almost haphazard by the wireless companies. The Code List for 1911 (pp. 102–103) contains a list of 361 American merchant vessels and yachts, arranged according to their wireless call letters. This publication was for the convenience of shipmasters in signaling, but the list when assembled shows defects. In some instances three letters of the alphabet are used, in others a letter and a number, and in others a number alone. Where two letters are used, in 6 cases the same two letters have been assigned

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to three vessels, and in 25 cases the same letters have been assigned to two vessels. It is time that the United States brought its wireless code into conformity with that of the rest of the world, just as our code of signals by flags and pennants is the international code. There must be a central bureau to assign wireless call letters to merchant vessels and yachts to prevent duplications and to bring these call letters into accord with the system adopted by the rest of the maritime world. Under the three-letter call adopted by the Berlin convention, over 18,000 distinctive calls can be assigned without duplication. This number will suffice for the wireless ship and shore stations of the world for years to come. The two-letter system now employed by the wireless companies in the United States will soon exhaust itself. The Bureau of Navigation was charged by the act of July 5, 1884, with the assigning of signal letters to American merchant vessels, and is making arrangements to assign wireless call letters at the same time, and do for the wireless code the work it now performs for the international code.

REGULATION OF RADIOCOMMUNICATION.

The Congress of the United States has been the first parliamentary body to recognize by statute the value of radiocommunication as a means of protecting life and property at sea.

The Austrian Reichsrath has passed a similar law applicable to Austrian ocean passenger steamships which navigate beyond the limits of the Mediterranean Sea. In the British House of Commons a bill was introduced, adopting substantially the language of our act, and supported by some of the most eminent names identified with maritime affairs in Parliament. It required, however, wireless equipment on cargo boats as well as ocean passenger steamships and failed to secure the necessary support of Government. While we have been first in prescribing the use of wireless apparatus on shipboard, we are behind all other nations in the necessary regulation of radiocommunication. The scope of radiocommunication and the rapidity of the development of the art may be gathered from the facts that in the first wireless experiments of Marconi in 1895, messages were transmitted only 2 miles, while the new naval wireless station at Arlington will send noontime, Washington meridian, when the time ball falls at the Navy Department, to all ships equipped with wireless within a radius of 1,500 miles on the Atlantic, and the station can send messages 3,000 miles. The need for regulation arises primarily from the fact that wireless messages interfere with one another, so that important dispatches on public business may be obstructed by the mischievous efforts of a tyro. Land-telegraph lines can not be set in operation anywhere without some official sanction for the erection of poles and stringing of wires, although one wire does not interfere with another. A fine of $1,000 or imprisonment for not more than three years is provided by section 60 of the Penal Code of 1909 for interference with messages over Government wires.

The ether is common property, and with the cheapest apparatus unrestrained trivial messages can create Babel. Again, bogus wireless messages may be sent by the reckless, and some have gone to the criminal length of "faking" the distress call of a passenger ship at sea.

The need for the regulation of wireless telegraphy, in order to secure the greatest benefit from it and prevent the establishment of a monopoly, led the Imperial German Government in 1903 to invite other nations to join with it in adequate international regulation. Such regulation, to be effectual, must be international, as wireless apparatus does not need to acquire any territorial right of way, and defies the boundary lines of nations. After preliminary correspondence and deliberation an international agreement was signed at Berlin by representatives of all the principal nations. That agreement, known as the Berlin International Radiotelegraphic Convention of November 3, 1906, has been ratified by 33 nations, including the greatest maritime powers, except the United States. Although the delegates of the United States were influential in shaping the agreement, it has not thus far been ratified by the Senate, mainly because it is difficult to adjust two of its requirements to our situation. The land-telegraph lines of Europe, Japan, and nations generally are owned by government and are usually operated as part of the national post-office system. In the United States, of course, the great telegraph systems are owned by corporations. The Berlin convention in article 10 and in several of the regulations fixes the rates for wireless dispatches and provides for their transmission over land lines to their terminus and from their point of origin. These propositions are familiar to the continental mind, but are innovations in the system of the United States, although not insuperable objections to the treaty. The third article of the Berlin convention provides:

> The coastal stations and the stations on shipboard shall be bound to exchange wireless telegrams without distinction of the wireless-telegraph system adopted by such stations.

This provision for interchange to prevent a world-wide monopoly, which was apprehended at one time, has been incorporated in essentials in section 2 of the wireless-ship act of June 24, 1910, mentioned at page 48 of the report.

The remaining important articles of the convention are:

> ART. 8. The working of the wireless-telegraph stations shall be organized as far as possible in such manner as not to disturb the service of other wireless stations.
>
> ART. 9. Wireless-telegraph stations are bound to give absolute priority to calls of distress from ships, to similarly answer such calls and to take such action with regard thereto as may be required.

The essential features of the service regulations, which are a part of the convention, are:

> I. The choice of wireless apparatus and devices to be used by the coastal stations and stations on shipboard shall be unrestricted. The installation of such stations shall as far as possible keep pace with scientific and technical progress.
>
> II. Two wave lengths, one of 300 meters and the other of 600 meters, are authorized for general public service. Every coastal station opened to such service shall use one or the other of these two wave lengths. During the whole time that a station is open to service it shall be in condition to receive calls according to its wave length, and no other wave length shall be used by it for the service of general public correspondence. Each government may, however, authorize in coastal stations the employment of other wave lengths designed to insure longe-range service or any service other than for general public correspondence established in conformity with the provisions of the convention, provided such wave lengths do not exceed 600 meters or that they do exceed 1,600 meters.
>
> III, 1. The normal wave length for stations on shipboard shall be 300 meters. Every station on shipboard shall be installed in such manner as to be able to use this wave length. Other wave lengths may be employed by such stations provided they do not exceed 600 meters.

2. Vessels of small tonnage which are unable to have plants on board insuring a wave length of 300 meters may be authorized to use a shorter wave length.

V. The exchange of superfluous signals and words is prohibited to stations of the class referred to in article 1 of the convention. Experiments and practice will be permitted in such stations in so far as they do not interfere with the service of other stations.

VI, 1. No station on shipboard shall be established or worked by private enterprise without authority from the government to which the vessel is subject. Such authority shall be in the nature of a license issued by said government.

3. The service of the station on shipboard shall be carried on by a telegraph operator holding a certificate issued by the government to which the vessel is subject.

To try to carry out so far as possible in the United States the important purposes of the Berlin convention, the Department of Commerce and Labor, in conjunction with the Treasury Department, the War Department, and the Navy Department, prepared a bill to regulate radiocommunication. This bill was the result of several months of conference between the departments concerned and the representatives of wireless companies, and was introduced in the Senate on March 17, 1910. It was discussed at length before the Senate Committee on Commerce and passed the Senate unanimously on June 16, 1910. A similar bill was reported unanimously to the House of Representatives on April 1, 1910, but held for the Senate bill which did not reach the House in time for action before final adjournment on June 25, 1910. The bills were accompanied by full reports from committees (S. Rep. No. 659, 61st Cong., 2d sess., to accompany S. 7243, and H. Rept. No. 924, to accompany H. R. 23595), which set forth fully the provisions and purpose of the bill. The bill provides, in brief, for Federal licenses for the operation of wireless apparatus at ship or shore stations and for Federal licenses for wireless operators. The President is authorized to establish regulations to prevent interference with messages relating to vessels in distress or of naval or military stations, and severe penalties are imposed for uttering false or fraudulent distress calls and messages. Distress messages and naval and military messages have priority. The general administration of the bill is intrusted to the Secretary of Commerce and Labor, and the measure itself is carefully drawn within the commerce clause of the Constitution. It is very much hoped that the bill may be passed at the coming session of Congress, as six months' notice should be given before enforcement. It is a necessary supplement to the wireless-ship act, and will bring the United States abreast of other nations. Such legislation would be necessary if we adhere to the Berlin Radiotelegraphic Convention. It is hoped that the Senate may yet find a way to ratify that convention, but if the objections arising from our land-telegraph system can not be overcome or passed by, then the passage of the bill referred to will secure to the United States the essential benefits which the international convention has brought to other nations. The International Radiotelegraphic Conference will assemble at London on June 4, 1912, and although the United States is not a party to the convention we should be represented at the conference. Radiocommunication, now only 17 years old, is plainly destined to play a part of growing importance in commerce and navigation, and if this country should unavoidably ever become involved in war it will be invaluable in national defense.

GOVERNMENT OWNERSHIP.

The desirability of Federal regulation of radiocommunication compels attention to the essential difference between the relations of wireless telegraphy to the Government of the United States and to the governments of all the other great powers. A brief inspection of the list of wireless shore stations of the world in Appendix M[1] (compiled from the useful list, giving various important details, of the Bureau of Steam Engineering, Navy Department) will well repay any man who desires to acquaint himself with the situation throughout the rest of the world, and in the United States. That glance will show that in virtually every other country and in all the great colonies of European countries the wireless shore stations are owned and operated by the governments, respectively. In Great Britain and Canada there are some commercial wireless coast stations, but it will be noted that the territory which each may cover is also covered by a Government station. Discriminating examination of the list will also disclose a complete cordon of American naval wireless stations around the coast from Maine to New Orleans, branching off to Porto Rico, the naval station at Guantanamo, Cuba, and the Canal Zone, and thence up the Pacific coast to Unalaska and the Pribilof Islands, with "branch lines," so to speak to Hawaii. Guam, and the Philippines. The Japanese Government carries the principle of government ownership further than European powers, and the Japanese trans-Pacific passenger steamships are equipped with apparatus furnished by the Government and operated by employees of the Government.

The extent of government ownership abroad is due primarily to the fact that wireless telegraphy is operated as a branch of each country's general telegraph system, and the telegraph systems are organized under and managed by the post office departments of each country, respectively, with which they have obvious and necessary connection anywhere.

There is another reason, however, for the extent of government ownership of wireless telegraphic systems. Land-telegraph lines fall entirely within territorial jurisdiction. They can at any time, if necessary, be seized, controlled, or cut off entirely by a simple pair of nippers. While submarine transoceanic cables are under international protection (Navigation Laws, 1911, p. 443), license to establish a cable landing and shore station must be secured from government. In our war with Spain the facility with which ocean cables may be cut as a measure of offense or defense was repeatedly demonstrated. From its nature, wireless telegraphy pays no heed to territorial boundaries. It can be controlled in event of war, or, even further, in the tense and vital periods of preparation which immediately precede the actual declaration of war, only by the most searching and complete surveillance of government. The reasons for complete government control of wireless coast stations appeal even to the mind to which the general theory of government ownership is objectionable. In the event of war involving the United States—improbable but still possible—we should find any possible antagonist equipped to-day, and long before a possible declaration, with virtually complete control of all the wireless systems within his jurisdiction. Our preparation consists of a complete naval coast system, with the admirable interior military system of the Signal Corps, but in addition there are numerous commercial stations of more or less efficiency which would have to be put at least under surveillance and probably would have to be taken over entirely by Government.

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[1] Not printed in this volume. See note on p. 609.

In peaceful times, like the present, the commercial system of the United States in respect of wireless telegraphy presents a striking example of economic waste. We have a Government seacoast system, maintained by Congress, so complete that it is within bounds to say that any ship equipped with wireless apparatus under the wireless-ship act of 1910 can be in communication with a naval shore station at all times on voyages along the coast between ports 200 miles or more distant. This Government system is duplicated at some points and to a greater or less degree of efficiency by commercial stations owned and operated by four or five corporations. It is no trade secret that thus far these corporations have not declared large dividends. Possibly in some instances the returns have been invested in experiments or improvements; possibly plants have been erected ample to supply a future rather than the present demand, and there may have been even instances where stock has been issued on no more tangible an asset than the ether itself. Waiving the matter of national defense, the dual system of Government and private shore stations means wastefulness to the people of the United States. This waste, from the nature of things, must increase as competing companies extend their plants and duplicate among themselves apparatus, stations, and operators, or one company will in time absorb the others and establish a monopoly. The situation has been brought home to this Bureau in the enforcement of the wireless-ship act. One company, which has equipped many trans-Atlantic steamships, has no Pacific coast stations in the United States. Several other companies have various vessels equipped, but only limited shore facilities. So far as possible, Congress has regulated the situation by providing for compulsory interchange between systems, but there can not be cordial cooperation when one company must devote its shore plant, representing considerable investment, to aid a competitor without any shore equipment, in competing with it for business on shipboard. The naval coast stations, in the last analysis, are the immediate guaranty that the law can and will be effective.

In the light of experience it is probable that, if we had now to meet at the beginning the question of land-telegraph lines, the United States would have assumed the ownership and operation of them as other nations have done. Our telegraph systems now represent an immense investment and, even if acquisition were deemed desirable, which is not here for a moment intimated, the cost to the Treasury would be very large. Commercially the wireless systems in the United States are infants. One, for example, with a nominal capital of hundreds of thousands, represents an actual investment of $30,000. The principal companies at the present time are engaged in expensive litigation over patent rights. That the companies are thus involved is not a reason for taking advantage of weakness and dissension. It is, however, a contributory disclosure of the fact that the actual investments thus far made are small and not yet of assured value. If it should be deemed desirable for the Government of the United States to acquire the same ownership and control of wireless stations within its limits which other nations have acquired virtually from the outset, that result can be brought about, with adequate consideration for all bona fide investments of individuals, at much less cost and with much less disturbance to the established order of things now than in the course of a few years. There are, of course, some obvious objections to the suggestion, and it may be urged that the course of invention would be hampered by Government ownership. The suggestion, not recommendation, of Government ownership has been made with diffidence, because it has been forced by experience upon the Bureau, at the outset opposed on conviction to the principle involved. The matter is too large and involves too many questions to be the basis of recommendation by an ordinary bureau.

Selection from

REPORTS

OF THE

DEPARTMENT OF COMMERCE AND LABOR

1912

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WIRELESS SHIP ACT.

The act of June 24, 1910, to require apparatus and operators for radio communication on certain ocean steamers took effect on July 1, 1911. The first year of its operation has amply demonstrated the wisdom of its enactment. At home Congress has greatly extended its scope. Abroad its general principles have been indorsed by the International Radiotelegraphic Conference at London, in June and July, and recommended to maritime powers as the basis of legislation. A British merchant shipping advisory committee, appointed in April from representatives of British commercial maritime interests, recommended on July 24, that the substantial features of the act of June 24, 1910, be enacted by Parliament, and the president of the board of trade has announced that a bill on the subject has been prepared. The several events which have demonstrated the foresight of Congress in passing the original act of 1910 and extending in 1912 its scope and provisions are known to all.

The act which went into effect on July 1, 1911, in brief provided that on all ocean-passenger vessels, American and foreign, carrying 50 or more persons, including passengers and crew, from ports of the United States to ports 200 miles or more distant there must be efficient apparatus for radio communication, with a skilled operator in charge, capable of transmitting messages at least 100 miles by day. To prevent monopoly the act also required that the apparatus on ships, as a condition of efficiency, must exchange messages without regard to the system employed.

Soon after Congress assembled a bill was introduced in the Senate on December 14, 1911, prescribing that two operators should be required after July 1, 1912, on all ocean steamships carrying 100 or more passengers. The Department's brief experience with the law had shown that some measures were necessary to provide against situations which might arise during the time when the operator was necessarily off duty and asleep. While search for some means within the act was being made the stranding of the steamship *Prinz Joachim* in November created a sentiment in favor of two operators and a constant wireless watch, which was embodied in the bill mentioned. The act which finally resulted from a conference of the two branches of Congress and was approved on July 23, 1912, provides, in addition to two operators, that there shall be an auxiliary power supply, independent of the vessel's main power plant, and thus available in case of disaster disabling that plant, which shall be capable of carrying on communication for at least four hours over a distance of at least 100 miles. The question of this auxiliary power supply was carefully considered in the conference of the Senate and the House. An alternative proposition that the auxiliary power supply should be capable of operating for as long as six hours, but over the shorter distance of 80 miles, was discussed. The conclusion was reached that in the event of disaster the immediate utterance of the distress call over the widest practicable stretch of waters was of the first importance, and that a call sent over 100 miles for a possible period of four hours would usually be more efficacious than a call sent over only 80 miles, but possibly maintained for six hours. The likelihood of a ship remaining afloat after a serious disaster for four hours is, of course, greater than for six hours, and the conclusion reached by Congress in this respect will probably not be changed. It has proved entirely feasible to secure the auxiliary apparatus prescribed, and the work of installing it has made rapid progress, under tests of the Department's inspectors, with the cooperation of naval stations.

The act of 1912 also provides that there shall at all times be efficient communication between the radio room and the ship's bridge. The purpose of this requirement is twofold: First, to enable the master of the vessel to be certain that an operator is at all times on watch, and, second, both to enable the master to communicate orders promptly to the operator and to enable the operator to communicate to the master at once information necessary to the safety of his own ship or the peril of other ships. The act also affirms the supreme authority of the captain of the ship over both the operators and apparatus, which is an obvious necessity.

The act of 1910 applied only to ocean-passenger steamers carrying 50 or more persons, including passengers and crew. The act of 1912 extends the scope of the measure in several particulars. After October 1, 1912, apparatus and operators were required on passenger ships licensed under the inspection laws to carry 50 or more, as well as those actually carrying that number, in order to provide the safeguard of radio communication during the dangerous winter months for ships which carry a passenger list much below the number authorized by their certificates.

After July 1, 1913, the act will apply to ocean-cargo steamers carrying a crew of 50 or more, with the qualification, however, that the second operator may be a member of the crew, who shall keep watch only for distress calls and calls relating to danger, and will thus be able to call the operator in emergency when off duty. The owners of American cargo steamers have already voluntarily begun the installation of the apparatus and employment of the operators prescribed months in advance of the law. It is not improbable that foreign ship owners and possibly foreign governments may deem a less rigid requirement desirable in their own ports. Unofficially it is stated that the German proposition contemplates compulsory apparatus on ships carrying a minimum of 60 persons. The report of the British advisory committee already referred to contains the following suggestion on the subject, which may be of academic interest here:

> We are of the opinion that if Parliament, in the interests of the community, compels any of the cargo vessels to carry wireless installations, the owners of such vessels should be reimbursed out of the public funds for any expenditure imposed on them by complying with such compulsory requirements.

After April 1, 1913, the act of 1912 will apply to passenger and cargo steamers on the Great Lakes. Many Lake vessels are already so equipped, and Lake shipowners themselves requested that the act be applied on those waters. In fact, however, there are no cargo boats on the Lakes which have crews of 50 or more persons, and the great majority of the passenger steamers make runs of less than 200 nautical miles between ports.

SCOPE OF THE ACT.

In last year's report it was estimated that the act of June 24, 1910, would apply to 10,000 departures of passenger steamers during the fiscal year. During the month of July, 1912, the total number of departures of American vessels subject to the act was 946 and of foreign vessels 261, in all 1,207 for that month from 28 seaports, indicating fully 12,000 departures for the year. Of course, in the case of American ships both terminals are included, as voyages between American ports are usually less than a month in duration. Thus, one American steamer in trade between San Francisco and Honolulu or between New York and New Orleans will depart from both ports during a month. The departures of cargo vessels, which, after July 1, 1913, will be subject to the act, were reported by collectors of customs for July, 1912, as 100 American steamers and 67 foreign steamers, 167 in all, for the month, and probably 1,600 for the year. Collectors at 10 Great Lakes ports report for July the departure of 218 American vessels and 101 foreign vessels (92 from the Marquette district) which, after April 1, 1913, will be subject to the act. It is probable, however, that in these returns some vessels have been included which do not, in fact, make voyages of 200 nautical miles between ports. The lake season of navigation lasts but 8 months, and it does not seem likely that during this period, when the law is actually applied, more than about 1,000 departures of passenger steamers will fall within the act. Of course, large numbers of passengers are carried on some of these vessels.

YEAR'S OPERATIONS.

The preliminary work and work of the first three months under the act of June 24, 1910, were covered in last year's report. During the fiscal year the three inspectors made 2,207 careful inspections of the apparatus of ocean-passenger steamships shortly before their departure. The details of vessels inspected are printed in Appendix K. The total cost of the service was $6,959.01, or a trifle less than $3.11 for each inspection. Of the inspections 1,408 were at Atlantic and Gulf ports and 799 at Pacific ports. The inspections at New York numbered 1,076 and at Boston 30, in all 1,106 for that district; at San Francisco, 785; Port Townsend, 13; and Portland, Oreg., 1; in all, 799 for that district; and for the rest of the Atlantic and Gulf coasts, 238 at Baltimore, 15 at Philadelphia, 3 at Norfolk, 8 at Savannah, Ga., 1 at Brunswick, Ga., 3 at Jacksonville, Fla., 1 at Knights Key, Fla., 1 at Key West, Fla., 25 at New Orleans, La., 5 at Galveston, Tex., 1 at Tampa, Fla., and 1 at Mobile; in all, 302 for that district.

The inspectors were established at New York, whence two short inspection trips were made to Boston; at San Francisco, whence one short trip was made to San Pedro and Los Angeles, one short trip to Portland, Oreg., Tacoma and Port Townsend, Wash., and two short trips to Seattle (one to experiment with auxiliary apparatus at sea). The Baltimore inspector made one general trip to all the principal seaports from Baltimore to Galveston, stopping about a day at each to advise collectors of customs. One trip was made to Philadelphia and an additional trip to New Orleans.

The appropriation did not suffice to establish an inspector at Gulf ports, where one was plainly required, but as soon as Congress increased to $10,000 this appropriation an inspector was sent early in July to New Orleans. The need of Government inspection has been demonstrated daily, and the service has been cordially approved by the masters and owners of steamships. The apparatus is delicate and easily disarranged, and in numerous instances the operators have relied on the inspectors for instruction in readjustment. The art itself is relatively new, and constant experiments in apparatus are being attempted, the results of which are not always satisfactory. It has been the aim of the Bureau to keep the inspectors in close touch with the Bureau of Standards so that they may be advised of the latest demonstrated improvements, and by giving the captains, operators, and owners of ships the benefit of this knowledge they may further contribute to the safety of ocean navigation. The furnishing of apparatus and operators to ships is a commercial venture, the aim of which is profit, yet on that venture may depend the safety of thousands of ocean travelers. All the considerations in favor of Government inspection, which were set forth in last year's report, have been justified by the year's experience.

REGULATION OF MONOPOLY.

In last year's report the steps taken by Congress thus far to prevent the establishment of a monopoly in radio communication were referred to. The value of radio communication, or wireless telegraphy, as an instrumentality for promoting safety of life at sea has impelled within two years the prompt enactment of measures prescribing apparatus and operators on nearly all types of vessels to which they are adapted, and an extension of the scope of the legislation in the immediate future does not seem necessary or desirable. The requirements of the laws have created a demand for apparatus and operators which have taxed the resources of manufacturers and schools, and in some respects, especially in the matter of auxiliary apparatus, the Department has been required at times to show some leniency until the supply could be brought up with the demand.

The first act of 1910 required interchange between different systems of radio communication in order to prevent monopoly and the same principle was extended in the ratification of the Berlin Radiotelegraphic Convention and the act to regulate radio communication. The power to fix rates for messages also seems ample. In very few instances do steamers own their own radio apparatus and employ their operators. The usual course is to pay to the wireless company a fixed monthly or yearly rental which covers the installation and use of the apparatus and the wages of operators. The board and lodging of the operators, of course, are furnished by the ship; the apparatus is kept in repair by the wireless company, and messages relating to navigation and the ship's business are transmitted free of charge. The tolls for the messages of passengers are collected by the operator for the benefit of the wireless company installing the apparatus. So long as several wireless companies were competing in the United States for the business of supplying apparatus and operators for ships, the usual economic law of supply and demand regulated charges for installations. Indeed, so keen was the rivalry for business that, as has been developed by Government inspections under the act of 1910, apparatus far short of the reasonable requirements of the law had in some instances been supplied, and in some cases ships have been about to depart with apparatus inert and useless, until the Department's inspector disclosed to the master the situation.

Within the past few months competition in the United States has nearly ceased. Partly as the result of decisions in patent cases before the courts of the United States, and partly as the result of internal financial conditions of the corporations, the United Wireless Co., hitherto the most extensive American company in the business, has been absorbed by the Marconi Wireless Telegraph Co. of America. The National Electric Signaling Co., a corporation which has made large expenditures in experiments and developing high-grade apparatus, in consequence of decisions by the courts, has gone into the hands of receivers, and does not at present supply apparatus to ships. There are several lesser companies, which have not for several years been active factors in the market. Practically the supply of apparatus and operators for radio communication in the United States is now in the hands of the Marconi company of America. The apparatus is a necessity of modern navigation. The report of the British merchant shipping advisory committee already mentioned, after reviewing the progress of British patent cases, observes:

> We have arrived at the conclusion that any British shipowner dealing with the Marconi company's competitors will do so at the risk of costly litigation, and, further, as matters stand at present, any effective competition with the Marconi company in the supply of installations may be impracticable. In considering the present commercial position it must be further borne in mind that so long as the rival patents are held in only a few hands, there is risk of the competitors amalgamating or of pooling their commercial interests, so as to obtain on joint account the best possible price for all their installations. This risk is emphasized by the fact that whilst the Telefunken system is at war with the Marconi system in this country they are apparently working as an amalgamated company in Germany. It would, in our opinion, be impossible to require by law merchant vessels to be fitted with wireless telegraphic apparatus if thereby shipowners were delivered into the hands of a monopoly which could impose such terms as it pleased without stay or hindrance. Before Parliament can apply compulsion to any class of ship, it must therefore, in our opinion, first establish the conditions of a free market in the installations, or otherwise insure their supply to merchant vessels at a reasonable commercial cost and under reasonable commercial conditions.

In England, under the acquired patent of 1897 of Sir Oliver Lodge, the Marconi company is bound "to grant licenses to all who desire to make use of the protected invention, on such terms as a duly qualified arbitrator, to be nominated by the board of trade, shall think fair and reasonable." The board of trade referred to is, of course, the department of the British Government corresponding in powers and scope to the Department of Commerce and Labor.

The licenses about to be issued by this Department, under the act to regulate radio communication to commercial ship and coast stations, contain the following condition:

> 3. The authority conferred by this license is subject to the provisions of the act of February 4, 1887, entitled "An act to regulate commerce," as amended by the act of June 18, 1910, so far as the licensee may be within the operation of said act, and except as provided in the act of August 13, 1912, or in the International Radiotelegraphic Convention and regulations made part thereof, the station shall transmit all messages offered by those who tender lawful rates on equal terms without discrimination, whether as regards rates, order of transmission, or otherwise.

The maximum rates for messages will be fixed in the license in accord with the Berlin convention and the act to regulate radio communication.

It will be recalled that section 7 of the act of June 18, 1910, brought wire or wireless telegraph companies within the scope of the interstate commerce act of 1887. The clause quoted in the form of license adopted is designed to be a full expression of the powers which Congress has entrusted to the Secretary of Commerce and Labor in the matter of message rates, but it does not extend to the charges for rentals, and apparently the commerce act of 1887 as amended does not meet the situation. That result could be attained by extending the authority the Secretary of Commerce and Labor now has over licenses, under the act of August 13 and the international convention, so as to enable him to exercise the powers as an arbitrator over rental charges with which the British Board of Trade has been entrusted. A more satisfactory way of solving the problem perhaps may be found.

BERLIN RADIOTELEGRAPHIC CONVENTION.

The Senate on April 3 ratified the Berlin Radiotelegraphic Convention. The general purpose of that convention is to secure the maximum efficiency of the new instrumentality in communication between ships at sea and between ships and coast stations, especially in so far as distress signals and information concerning navigation are involved. The regulations are international, and in principle are the same as those upon which the international code of signals by means of flags, pennants, and burgees was based nearly 70 years ago. The difference in the workings, range, and efficacy of the two systems is a measure of human advance in that period. The convention binds each nation to enact legislation to give it effect. Early in the session and long before the convention was ratified the committees of the Senate and the House of Representatives, having jurisdiction, began to frame the law to give effect to the treaty and to secure to the United States the benefits which the experience of nations generally had demonstrated would result from the regulation of radio communication.

REGULATION OF RADIO COMMUNICATION.

The act to regulate radio communication was approved on August 13 and will take effect on December 13. In brief it prescribes that all apparatus and operators for radio communication within the jurisdiction of the United States (except Government stations and operators and those in the Philippines) shall be licensed by the Secretary of Commerce and Labor. Such licenses are prescribed by the international convention so far as international communication is concerned, and the act thus carries out the obligation of the United States. The same principle is applied to all land stations and operators within constitutional jurisdiction. The tendency abroad for some years was to restrict the use of the invention to military and naval purposes, but as its commercial feasibility and value have been demonstrated, its larger use within reasonable limitations has been provided for, and the act of August 13, in the main, is based on the power to regulate interstate and foreign commerce, with the power to provide for the common defense invoked in certain portions of the measure.

The act differs in one essential respect from general legislation of recent years in that it does not delegate wide powers of regulation to an executive department, but in the body of the statute itself states with particularity the regulations which are to govern administrative officers and private interests alike. The act has not yet taken effect, but in the preparations for its enforcement the specific requirements of the act have, in the main, helped rather than hindered preliminary work, and have proved preferable to a wider latitude of administrative authority.

The time allowed to carry out the act was somewhat short in view of its application to the entire United States and to ship and land stations, which will number several thousands. The act was passed August 13 and the appropriation to give it effect on August 26. Civil-service examinations for positions of radio inspector, for which the test papers had been prepared in advance of the appropriation, were held on September 25 throughout the country, and the first inspectors were appointed on probation on October 16. The examinations furnished a body of young men especially qualified by practical experience and by scientific attainments. To make sure that practical men had been secured, the successful applicants were assigned for brief terms of duty at the port of New York, where nearly all varieties of radio apparatus may be examined, and at the Bureau of Standards, to familiarize them with the latest scientific developments in radio communication. The administration of the law is thus in the hands of a competent and intelligent field force. The inspectors were at their posts by November 18.

The preparation of the necessary forms and blanks has advanced rapidly and special instruments for the use of inspectors have been devised by the Bureau of Standards and will be available as soon as the manufacturers can turn them out, which will not be until January. In the meantime that Bureau, with the cooperation of scientific institutions which are interested in the success of the law, is assisting inspectors with the loan of instruments and with temporary devices to assist in the performance of their preliminary work. Although endeavors in all lines to carry out the act have been maintained constantly at high pressure since the adjournment of Congress, it is probable that preparations will not be completed in all parts of the country by December 13, and especially in States bordering on the Great Lakes, where navigation will soon close. Through interior States the act can not be carried out before 1913. The companies operating radio apparatus for commercial purposes in many instances must make changes in antiquated apparatus to bring it into conformity with law, and it is quite probable that these changes will not be completed in all instances by December 13.

The act to regulate radio communication is closely interwoven with the wireless-ship act of 1910, and the administrative machinery to carry out the two laws and the Berlin convention have been consolidated. The entire United States has been divided for the purpose into nine districts, as follows:

1. BOSTON, MASS.—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut.
2. NEW YORK, N. Y.—New York (county of New York, Staten Island, Long Island, and counties on the Hudson River to and including Albany and Rensselaer) and New Jersey (counties of Bergen, Passaic, Essex, Hudson, Union, Middlesex, Monmouth, and Ocean).

3. BALTIMORE, MD.—New Jersey (all counties not included in second district), Pennsylvania (counties of Philadelphia, Delaware, all counties south of the Blue Mountains and Franklin County), Delaware, Maryland, Virginia, District of Columbia.
4. SAVANNAH, GA.—North Carolina, South Carolina, Georgia, Florida, Porto Rico.
5. NEW ORLEANS, LA.—Alabama, Mississippi, Louisiana, Texas, Tennessee, Arkansas, Oklahoma, New Mexico.
6. SAN FRANCISCO, CAL.—California, Hawaii, Nevada, Utah, Arizona.
7. SEATTLE, WASH.—Oregon, Washington, Alaska, Idaho, Montana, Wyoming.
8. CLEVELAND, OHIO.—New York (all counties not included in second district), Pennsylvania (all counties not included in third district), West Virginia, Ohio, Michigan (lower peninsula).
9. CHICAGO, ILL.—Indiana, Illinois, Wisconsin, Michigan (upper peninsula), Minnesota, Kentucky, Missouri, Kansas, Colorado, Iowa, Nebraska, South Dakota, North Dakota.

The division is tentative and is based partly with a view to the amount of work for each inspector and partly with a view to economy in traveling expenses. Experience will doubtless suggest some modification of these districts.

The cordial cooperation of the Navy Department with the Department of Commerce and Labor in enforcing the act of 1910 was mentioned in last year's report. It has been maintained and greatly extended, and the cooperation of the War Department (Signal Corps) has been offered with equal courtesy. As a result the examination of operators for licenses prescribed are now held at the United States navy yards at Boston, Mass., Brooklyn, N. Y., Philadelphia, Pa., Washington, D. C., Norfolk, Va., Charleston, S. C., New Orleans, La., Mare Island (San Francisco), Cal., and Puget Sound, Wash.; at the naval stations at Key West, Fla., San Juan, P. R., and Honolulu, Hawaii; at the Naval Academy, Annapolis, Md.; also at Fort Sam Houston, San Antonio, Tex., Fort Wood, New York Harbor, Fort Monroe (artillery school), Va., Fort Omaha, Nebr., and Fort Leavenworth, Kans.; at the Army stations at St. Michael, Alaska, and Fairbanks, Alaska; also at the Bureau of Standards, Washington, D. C., and by the Department's radio inspectors at the customhouses in their districts and elsewhere by arrangement with them.

Office accommodations for the radio inspectors, through the courtesy of the Treasury Department, have been secured in the offices of collectors of customs, with whom the ship work brings them in daily contact at eight principal ports; but at Boston, where a new customhouse is under construction, it may prove necessary to rent a small office for the inspector. The appropriation by Congress provided for this contingency.

APPROPRIATIONS.

For the current fiscal year Congress appropriated $10,000 in the legislative appropriation act for the enforcement of the act of June 24, 1910, an amount indispensable to give force and vitality to the original act. During the past session, as already indicated, the requirements of that act were considerably increased and its scope was materially extended; the Berlin convention was ratified, and the act to give it effect and to govern radio communication generally was passed. To carry out these measures Congress, in the general deficiency act, appropriated $27,880, which may be consolidated with the former sum, making $37,880 available for the current year, or, strictly speaking, for 10 months after the second appropriation was passed.

The estimate for the 12 months of the next fiscal year, which is, of course, now included in one item for the legislative bill, amounts to $38,140. The initial cost of securing testing instruments, which are somewhat expensive, equipping offices, and setting type at the Printing Office for the first issue of the various forms and blanks needed will be met out of the current appropriations, so that the laws can be carried out for 12 months after July 1, 1913, at a cost substantially the same as for less than 10 months in part for the current year. A summary of the purposes for which the money was desired was submitted in August to the Appropriation Committees of both branches of Congress.

GOVERNMENT COAST STATIONS.

In virtually every other country except the United States and in all the great colonies of European countries the radio shore stations are owned and operated by the governments, respectively. The reasons for this ownership and operation were considered at some length in this report last year.

The eighteenth regulation of the act of August 13, 1912, provides that the cordon of naval coast radio stations which protect our entire coasts and outlying territories and possessions shall be available for commercial service whenever a commercial station is not maintained within 100 miles of the nearest naval station, or at any point when the commercial station does not insure a constant service day and night without interruption. At the strategic points—Key West, Fla., San Juan, P. R., North Head and Tatoosh Island, Wash., and San Diego, Cal.—commercial messages will hereafter be handled entirely by the naval stations, and in Alaska commercial radio communication will continue to be conducted as at present, through the stations of the Signal Corps of the Army. Considerations which tell in favor of the system of complete government ownership of coast stations here, as abroad, were set forth at some length in last year's report, and experience during the current year should do much to determine whether they are practical.

LONDON RADIOTELEGRAPHIC CONFERENCE.

The diplomatic appropriation act provided for the participation of the United States, as recommended by the Secretary of Commerce and Labor, in the International Radiotelegraphic Convention at London in June and July. The American delegation was able to submit to the assembled representatives of maritime powers the legislation which Congress had taken up in December and January and advanced far toward enactment before the disaster to the steamship *Titanic* impressed upon the world the usefulness of such legislation. The seal of secrecy has not been removed from the London convention which, with or without amendments, will doubtless in time be submitted to the Senate. That seal, however, is not broken by the statement that the action of Congress at the last session contributed greatly to the requirements of the new convention in so far as they relate directly to safety at sea, and provide for greater certainty of maritime communication through the use of pure and sharp waves.

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LONDON RADIOTELEGRAPHIC CONVENTION.

The London Radiotelegraphic Convention was signed on July 5, 1912, and was ratified by the Senate of the United States on January 22, 1913. By its terms it took effect on July 1, 1913, the beginning of the current fiscal year. The Department of Commerce, with the cooperation of the Navy Department, War Department, and the Revenue-Cutter Service of the Treasury Department, began the enforcement of its self-executing provisions on September 1, 1913, the earliest date at which the necessary preliminary arrangements could be completed. The substantial differences between the London convention and the Berlin convention already in force were known confidentially to the committees of Congress concerned with pending legislation relating to radio communication, and but slight changes, consequently, will be required in the act of July 23, 1912, to require apparatus and operators for radio communication on certain steamships and in the act of August 13, 1912, to regulate radio communication. The most important technical change in the new convention is to increase from 300 meters to 600 meters the normal wave length for stations on shipboard to correspond with the progress in the art. The London convention is important in that it recognizes the principle of the pure and sharp wave, the authority of the master of the ship over the radio service on shipboard, the necessity for auxiliary apparatus for emergency use in event of the failure of the ship's main power plant, and the need of a constant watch (two operators), at least on board the larger passenger steamers. These provisions had already been included in the measures which Congress enacted into law soon after the signing of the convention in London.

At the London Conference on Safety at Sea, in November, the subject of radio communication will again be considered. It is advisable, therefore, to await the conclusions of that convention before undertaking to make the slight changes in our own statutes necessary to bring them into entire accord with the London Radiotelegraphic Convention.

RADIO COMMUNICATION.

As outlined in last year's report, the field service under the original act requiring apparatus and operators for radio communication on ocean steamers, passed July 24, 1910, was used as the framework for the much more extended organization called for by the act of July 23, 1912, and the act of August 13, 1912, to regulate radio communication. The latter act did not take effect until December 13, 1912, and consequently was in operation for only about half of the fiscal year. Work under the original act of 1910 was virtually confined to the seaports of New York, San Francisco, and Baltimore, with 6 brief inspection trips to 14 other ports. Under the new acts the inspection service has been maintained at the principal ports with increased efficiency, and in addition the radio inspectors have visited practically all of the principal seaports of the United States, ports on the Great Lakes, and many interior cities, in all 96 centers of radio communication. The chief inspector examined and adjusted the radio stations among the Hawaiian Islands and another inspector made a week's tour through Porto Rico, concluding arrangements which it is believed will secure compliance with the law even in the absence of an inspector. The stations on the Hawaiian Islands and in Porto Rico are in constant communication with ships at sea and their maintenance and operation in compliance with law requires at least annual inspection. It was not practicable to inspect the commercial stations in Alaska during the past fiscal year but this work will be undertaken during the spring of 1914. The table following shows at a glance the territory covered by the Bureau's radio inspectors and the periods during which the chief inspector and 10 inspectors were employed.

RADIO FIELD SERVICE.

Dates when districts were manned (headquarters in parentheses): No. 1 (Boston), one inspector November 11, 1912; No. 2 (New York), one inspector entire year, an additional inspector from November 1, 1912; No. 3 (Baltimore), one inspector entire year; No. 4 (Savannah), one inspector March 1, 1913; No. 5 (New Orleans), one inspector entire year; No. 6 (San Francisco), one inspector entire year, an additional inspector during interval from January 16, 1913, to June 30, 1913; No. 7 (Seattle), one inspector November 11. 1912, to January 16. 1913, continuously, and from then on intermittently for a total period of approximately 10 days; No. 8 (Cleveland), one inspector November 18, 1912; No. 9 (Chicago), one inspector November 18, 1912.

INSPECTIONS AND EXAMINATIONS.

Port visited.	Stations inspected.				Operators examined.		
	Ship.	Commercial.	Amateur and special.	Total inspections.	Commercial.	Amateur and special.	Total examinations.
First district:							
BOSTON, MASS	176	4	44	224	1	9	10
Cambridge, Mass			3	3			
Fall River, Mass			9	9			
Forest Hills, Mass			1	1			
New London, Conn		1		1			
Newport, R. I			8	8			
Newton, Mass			20	20			
Point Judith, R. I		1		1			
Portland, Me	2	1	3	6		3	3
Providence, R. I			24	24		11	11
Quincy, Mass	1			1			
Salem, Mass		1	6	7			
Siasconset, Mass		1		1	4		4
Somerville, Mass			3	3			
South Wellfleet, Mass		1		1	4		4
Woods Hole, Mass			2	2		1	1
Total	179	10	123	312	9	24	33
Second district:							
NEW YORK, N. Y	802	16	11	829			
Bayonne, N. J			1	1			
Sagaponack, N. Y	2			2			
Sayville, N. Y		1		1			
Seagate, N. Y		2		2			
Total	804	19	12	835			

INSPECTIONS AND EXAMINATIONS—Continued.

Port visited.	Stations inspected.				Operators examined.		
	Ship.	Commercial.	Amateur and special.	Total inspections.	Commercial.	Amateur and special.	Total examinations.
Third district:							
BALTIMORE, MD	315	2	38	355	176	35	211
Cape May, N. J		1		1	3		3
Norfolk, Va	12	2		14			
Philadelphia, Pa	89	12	1	102	6		6
Virginia Beach, Va		1		1			
Washington, D. C						2	2
Wilmington, Del	1		1	2			
Total	417	18	40	475	185	37	222
Fourth district:							
SAVANNAH, GA	114	1	4	119	6	8	14
Cape Hatteras (Buxton), N.C		2		2	3		3
Ensenada, P. R		1		1			
Jacksonville, Fla		2		2	1		1
Key West, Fla	2		3	5			
Pensacola, Fla			2	2			
San Juan, P. R	2			2			
Tampa, Fla	5	3		8	2		2
Total	123	9	9	141	12	8	20
Fifth district:							
NEW ORLEANS, LA	396	6	46	448	11	4	15
Burrwood, La		1		1			
Fort Morgan, Ala		3		3			
Galveston, Tex	2	2	6	10	8		8
Grand Island, La		1		1			
Houston, Tex		2		2	3		3
Mobile, Ala	1	3	6	10	2	1	3
Port Arthur, Tex		6	2	8	5		5
Texas City, Tex					4		4
Total	399	24	60	483	33	5	38
Sixth district:							
SAN FRANCISCO, CAL	1,088	5	4	1,097	570	44	614
Avalon, Cal		1		1			
DeRussey, Hawaii		1		1			
East San Pedro, Cal		1		1			
Heeia Point, Hawaii		1		1			
Honolulu, Hawaii	2			2	1		1
Kahuku, Hawaii		2		2			
Kaunakakai, Hawaii		1		1			
Kewaihae, Hawaii		1		1	1		1
Koko Head, Hawaii		2		2			
Lahaina, Hawaii		1		1			
Lihue, Hawaii		1		1			
Long Beach, Cal			5	5			
Los Angeles, Cal		6	71	77	15	34	49
Ocean City, Cal			5	5			
Pasadena, Cal			5	5			
San Diego, Cal	1	1		2			
San Pedro, Cal		2		2			
Total	1,091	26	90	1,207	587	78	665
Seventh district:							
SEATTLE, WASH	108	6	1	115	12	7	19
Astoria, Oreg	7	1	3	11	6		6
Friday Harbor, Wash		1		1			
Marshfield, Oreg	1	1		2	1		1
Portland, Oreg			1	1			
Total	116	9	5	130	19	7	26
Eighth district:							
CLEVELAND, OHIO	41	8	129	178	140	84	224
Akron, Ohio		1	1	2	2	1	3
Battle Creek, Mich		1		1			
Buffalo, N. Y	1	1	18	20	6	20	26
Conneaut, Ohio	2			2			
Detroit, Mich	3	1		4			
Fredonia, N. Y			2	2		2	2
Grand Haven, Mich		1		1	1		1
Total	47	13	150	210	149	107	256

INSPECTIONS AND EXAMINATIONS—Continued.

Port visited.	Stations inspected.				Operators examined.		
	Ship.	Commercial.	Amateur and special.	Total inspections.	Commercial.	Amateur and special.	Total examinations.
Ninth district:							
CHICAGO, ILL.	19	6	24	49	67	33	100
Beloit, Wis.			5	5		6	6
Duluth, Minn.		1	3	4	5		5
Illiopolis, Ill.			2	2			
Indianapolis, Ind.			4	4	5		5
Kansas City, Mo.		1	2	3	1		1
Kenosha, Wis.			4	4	9		9
Lafayette, Ind.			2	2	5		5
Manitowoc, Mich.		1	3	4	1		1
Milwaukee, Wis.	6	2	17	25	8	13	21
Minneapolis, Minn.			10	10	2	2	4
Racine, Wis.			4	4	3		3
St. Paul, Minn.			5	5		2	2
Valparaiso, Ind.			2	2	5		5
Total	25	11	87	123	111	56	167
Grand total	3,201	139	576	3,916	1,105	322	1,427

The total number of ship inspections in the table is 3,201. The number of such inspections in the two Great Lakes districts is relatively small, as it covers only the three months of April, May, and June; and the territory of each of these inspectors embraces several States. The ship inspections are now much more thorough and extended than were required under the original act of 1910. The later act not only extended the number of ships subject to inspection but it increased the requirements for apparatus. An auxiliary power supply is now prescribed, capable of working at least 4 hours over a distance of 100 miles, and the wisdom of this requirement was shown at the time of the loss of the steamer *State of California* and the British steamers *Templemore* and *Volturno*, in which cases it was necessary to make use of the auxiliary power supply. The revised act also requires efficient communication between the operator in the radio room and the master on the bridge. Inspectors are also required under the act to regulate communication to make sure that pure and sharp waves are emitted so as to prevent interference. The practical work of inspection is at least fourfold more thorough than under the original act of 1910. A constant wireless watch, involving the employment of two operators, is now prescribed by law and the number of operators subject to examination by inspectors has accordingly more than doubled.

The table above shows progress in the main satisfactory in securing compliance with the acts of Congress. The measure of success attended has been due in large measure to the zeal, enthusiasm, and good judgment of the corps of trained young men who have been secured as radio inspectors. They have already won for the service the respect of the most competent men engaged in radiotelegraphy and have secured the cooperation of the owners and masters of steamships, who, in many instances, now insist that wherever practicable the radio inspector shall examine the apparatus on board and certify to its condition before the ship leaves port. These men have all served day and night and in no instances have the full statutory vacations been requested.

Efforts during the current year, as heretofore, will be directed, first, toward promoting the efficiency and thoroughness of the work on shipboard; second, to the careful regulation of commercial shore stations; and finally, as opportunity offers, to subjecting amateur and special stations to such regulation and inspection as may be necessary to give effect to the will of Congress.

EXPENDITURES FOR THE YEAR ENDED JUNE 30, 1913.

The following table gives a concise statement of all the expenditures, aggregating $37,735.55, during the past fiscal year for all services rendered under the two acts mentioned and for the execution of the International Radiotelegraphic Convention by the Department of Commerce, excluding valuable services which can not be appraised in money rendered by the technical corps of the Bureau of Standards in the invention and improvement of appliances for the inspection of apparatus and in offering technical advice and instruction to the inspection corps.

Item.	Baltimore.	Boston.	Chicago.	Cleveland.	New Orleans.	New York.	San Francisco.
Equipment:							
Furniture	$0.45	$78.56	$5.25	$0.45	$0.45	$4.65	$13.45
Instruments	461.95	609.96	454.30	451.93	625.94	1,252.62	618.64
New construction	10.00	....	....	....	9.43	....	1.50
Typewriting machines, etc.	108.65	67.40	66.09	67.39	67.40	140.01	67.40
Laundry	1.54	....	4.52	2.24	.75	....	1.00
Repairs	....	5.55	....	....	....	....	9.00
Salaries	2,017.00	1,206.00	1,040.33	1,102.50	1,682.67	3,811.66	3,211.83
Services, nonpersonal	7.90	3.10	4.80	.50	7.38	2.70	8.35
Stationery:							
Books	29.53	24.37	24.62	29.87	29.53	67.13	29.53
Printing	20.59	40.75	39.80	23.84	39.81	75.92	26.74
Supplies	13.72	16.04	20.78	18.85	16.68	31.94	25.99
Supplies:							
Household	.23	.23	.23	1.08	.23	.46	.23
Cleaning and toilet	.10	.10	.09	.09	.10	.18	.09
Mechanics', engineers', and electricians'	.89	.89	.89	.89	.89	2.89	3.73
Other supplies	1.94	1.95	1.94	1.94	1.94	3.90	1.94
Telegrams	5.90	6.10	7.28	6.77	10.27	22.62	32.98
Telephones	26.59	21.50	.60	25.55	1.55	19.91	1.52
Transportation, persons	450.90	50.60	156.41	98.28	311.65	34.77	471.83
Street car fare	20.60	26.77	7.20	8.75	13.60	31.24	19.20
Subsistence	387.37	35.45	177.00	101.35	215.45	13.90	387.50
Express and freight	19.36	13.88	16.07	13.06	27.27	14.76	30.65
Total	3,585.21	2,209.20	2,028.20	1,955.33	3,062.99	5,537.16	4,957.20

Item.	Savannah.	Seattle.	St. Louis.	The Tarragon.	Bureau.	Total.
Equipment:						
Furniture	$0.45	$0.45			$104.05	$208.21
Instruments	451.95	446.90		$1,420.00	2,017.44	8,811.63
New construction		5.60		580.00		606.53
Typewriting machines, etc	67.40	67.40			138.75	857.89
Laundry		.20	$10.55		1.42	22.22
Rent, storage	1.28					1.28
Repairs					6.25	20.80
Salaries	725.00	573.33	303.26		4,328.22	20,001.80
Services, nonpersonal	.25	6.90	4.60		1.25	47.73
Stationery:						
Books	24.37	24.37	8.50		44.07	335.39
Newspapers					.25	.25
Printing	39.80	15.73			1,721.70	2,044.68
Supplies	12.10	11.84	2.40		72.44	242.78
Supplies:						
Household	.23	.23				3.15
Cleaning and toilet	.10	.09				.94
Mechanics', engineers', and electricians'	.89	2.46			.24	14.66
Other supplies	1.94	1.94	1.94		3.90	25.27
Telegrams	6.24	9.38	5.90		21.00	134.44
Telephones		.82	1.35		.75	100.14
Transportation, persons	6.00	207.10	265.70		97.91	2,151.15
Street car fare	10.00	4.40			4.85	146.61
Subsistence	6.45	174.24	178.85		117.90	1,795.48
Express and freight	4.70	12.89	6.15		3.25	162.04
Total	1,359.15	1,566.27	789.20	2,000.00	8,685.24	37,735.55

Total appropriation	$37,880.00
Total expended	37,735.55
Balance unexpended	144.45

In the table above the Bureau of Navigation is charged with $8,685.24. Of this amount, however, $2,017.44 is for special inspection apparatus retained ordinarily in the Bureau but sent to different ports to meet special requirements. The largest expenditure in any one district is $5,537.16 for the district comprising the city of New York, Long Island, the Hudson River to Albany and Troy, and most of the seacoast of New Jersey. The service at this port has been maintained by two radio inspectors with the assistance from time to time for office work of one or two stenographers. If it be recalled that over a million passengers are carried out of or into the port of New York by the ships whose wireless apparatus is to be closely examined by the inspectors before the ship sails, the expenditure of this amount seems very reasonable. The expenditures at San Francisco were $4,957.20, at Baltimore $3,585.21, and at New Orleans $3,062.99. In the remaining districts the service was not established until the fiscal year was well advanced. Toward the close of the fiscal year arrangements were made to equip with wireless the United States motor boat *Tarragon*, through which the navigation laws are enforced along the Atlantic seaports. The purpose in equipping this vessel was not so much its safety and convenience, though those considerations had weight, as to maintain a station moving from port to port which could note infractions of the laws concerning radiotelegraphy and secure compliance with them.

The largest item is $20,001.80 for salaries. Besides pay for the inspectors this amount covers expenses from time to time of stenographers and typewriters to assist them in office work. There is no economy in assigning typewriting work to a high-grade man whose services are worth from $1,800 to $2,100 for the actual inspection of delicate wireless apparatus on shipboard. The purely clerical work of these offices is well paid at the rate of $900 per annum and wherever the volume of such clerical work justifies it a stenographer and typewriter has been continuously employed during the busy season, or at some ports, for one or two days a week. The inspection services at some ports did not begin, as already indicated, until November; so the expenditures for salaries for the present and next fiscal years will be larger.

On the other hand, during the past fiscal year $8,811.63 was expended for instruments. This amount covers the necessary instruments for each inspector, including the decremeter invented for the service by Mr. Frederick A. Kolster, of the Bureau of Standards. By this instrument such good results have already been secured that the War and Navy Departments and commercial companies have since adopted it. A much smaller expenditure for instruments will suffice for some time to come but a reasonable allotment must be made for this purpose to keep step with the development of the art. The amount expended for travel and subsistence was $3,946.61, and this amount, of course, will be exceeded during the current year and the next fiscal year. The expenditures for printing have amounted to $2,044.68 and expenditures for this purpose hereafter will be covered in the Department's general printing allotment.

The examination of applicants for licenses as radio operators has been conducted by the Department's inspectors, with the cordial cooperation of the radio services of the Army and Navy. The standard of these examinations has been raised during the year and operators under the Department's licenses now compare favorably with operators licensed by foreign governments. The following table shows the number of licenses to operators of the various classes issued in the several radio districts:

RADIO OPERATORS' LICENSES ISSUED, BY DISTRICTS.

	Commercial grades.		Experiment and instruction grade.	Cargo grade.	Amateur grades.		Total.
	First.	Second.			First.	Second.	
First district:							
Radio inspectors	......	......	1	......	22	49	72
Army and Navy [a]	173	3	......	......	......	......	176
Second district:							
Radio inspectors	......	......	......	......	......	58	58
Army and Navy	[b] 494	97	......	1	366	......	958
Third district:							
Radio inspectors	47	13	6	......	32	50	148
Army and Navy	195	19	1	......	......	......	215
Fourth district:							
Radio inspectors	5	......	......	......	7	29	41
Army and Navy	12	3	......	......	......	......	15
Fifth district:							
Radio inspectors	18	7	......	......	4	28	57
Army and Navy	41	1	......	......	......	......	42
Sixth district:							
Radio inspectors	465	37	......	......	95	297	894
Seventh district:							
Radio inspectors	35	3	......	......	3	16	57
Army and Navy	65	25	......	......	......	......	90
Eighth district:							
Radio inspectors	61	49	......	......	105	238	453
Ninth district:							
Radio inspectors	21	58	......	......	22	1	102
Total	1,032	315	8	1	[c] 691	766	[c] 3,413

[a] Licenses issued by examining officers of the Army and Navy.
[b] Not included in these figures were 129 applicants examined who failed to qualify
[c] This total includes 35 licenses not classified by districts.

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RADIO COMMUNICATION.

The act requiring apparatus and operators for radio communication on ocean steamers was passed June 24, 1910, and took effect July 1, 1911. Its scope was greatly extended by the act of July 23, 1912, and this was followed by the ratification by the Senate of the Berlin Radiotelegraphic Convention, of the London Radiotelegraphic Convention, and by the act of August 13, 1912, to regulate radio communication. The radio service of the Bureau of Navigation, begun three years ago, has now been organized in a manner which it is believed will admit of economical and orderly performance of the work prescribed by Congress. This work consists of the inspection of the apparatus and operators on ship stations, American and foreign, and at coast stations, commercial, experimental, and amateur; of the license of American stations, ship and shore, and of the several classes of operators; and, finally, of general assistance and cooperation in securing improvements in apparatus and raising the standard of operators. The field force during the past fiscal year comprised 12 inspectors. The following table shows the number of inspections of stations and the number of operators examined as to qualifications by the radio-inspection force for 1914, with brief comparative figures for 1913:

INSPECTIONS AND EXAMINATIONS.

[District headquarters shown in small capitals.]

Ports visited.	Stations inspected.				Operators examined.		
	Ship.	Commercial, land.	Amateur and special, land.	Total.	Commercial.	Amateur and special.	Total.
First district:							
BOSTON, MASS.	866	7	73	946		70	70
Cape Cod, Mass.		1		1			
New Bedford, Mass.			4	4		3	3
Newport, R. I.		1	11	12			
Portland, Me.	43		5	48			
Siasconset, Mass.		2		2			
South Wellfleet, Mass.	1	4		5			
Woods Hole, Mass.			2	2			
Total. 1914	910	15	95	1,020		73	73
1913	179	10	123	312	9	24	33
Second district:							
NEW YORK, N. Y.	2,022	12	18	2,052		6	6
Binghampton, N. Y.		1		1			
Sagaponack, N. Y.					1		1
Scranton, Pa.		1		1			
Tuckerton, N. J.		1		1			
Total. 1914	2,022	15	18	2,055	1	6	7
1913	804	19	12	835			
Third district:							
BALTIMORE, MD.	375	2	19	396	63	250	313
Atlantic City, N. J.			3	3			
Cape May, N. J.		2	3	5			
Jenkintown, Pa.			2	2			
Norfolk, Va.	125			125	1	10	11
Philadelphia, Pa.	228	9	13	250	1	6	7
Rockville, Md.			1	1			
Virginia Beach, Va.		1		1			
Washington, D. C.	3			3			
Wildwood, N. J.			2	2			
Total. 1914	731	14	43	788	65	266	331
1913	417	18	40	475	185	37	222

INSPECTIONS AND EXAMINATIONS—Continued.

Ports visited.	Stations inspected.				Operators examined.		
	Ship.	Commercial, land.	Amateur and special, land.	Total.	Commercial.	Amateur and special.	Total.
Fourth district:							
SAVANNAH, GA	216	7	8	231	9	13	22
Brunswick, Ga	1			1			
Cape Hatteras, N. C		2		2			
Charleston, S. C	1	1		2	1		1
Jacksonville, Fla	11	3	12	26	3		3
Key West, Fla	4			4			
Miami, Fla		1		1			
Tampa, Fla	2	2		4	2		2
Total, 1914	235	16	20	271	15	13	28
1913	123	9	9	141	12	8	20
Fifth district:							
NEW ORLEANS, LA	645	18	38	701	17	10	27
Algiers, La	1			1			
Beaumont, Tex			2	2			
Burrwood, La	1	1		2			
Fort Morgan, Ala		1		1			
Galveston, Tex	69	3		72	3	2	5
Grand Isle, La		3		3			
Mobile, Ala		1	2	3	1		1
Montgomery, Ala			3	3			
Port Arthur, Tex	5	3		8	1		1
Texas City, Tex	3			3			
Total, 1914	724	30	45	799	22	12	34
1913	399	24	60	483	33	5	38
Sixth district:							
SAN FRANCISCO, CAL	959	4	7	970	927	98	1,025
Avalon, Cal		1		1			
East San Pedro, Cal		1		1			
Los Angeles, Cal	1	3	3	7	8	5	13
San Diego, Cal		1	1	2			
San Luis Obispo, Cal		1		1			
Total, 1914	960	11	11	982	935	103	1,038
1913	1,091	26	90	1,207	587	78	665
Seventh district:							
SEATTLE, WASH	702	2		704	36	63	99
Total, 1914	702	2		704	36	63	99
1913	116	9	5	130	19	7	26
Eighth district:							
CLEVELAND, OHIO	96	2	2	100	149	338	487
Ashtabula, Ohio	2	1		3			
Buffalo, N. Y	4	2		6	2		2
Conneaut, Ohio	4			4			
Detroit, Mich	21	7		28	5		5
Frankfort, Mich	5	2		7	2		2
Grand Haven, Mich		2		2			
Ludington, Mich	7	2		9	3		3
Total, 1914	139	18	2	159	161	338	499
1913	47	13	150	210	149	107	256
Ninth district:							
CHICAGO, ILL	60	1	5	66	59	65	124
Calumet, Mich		1		1	1		1
Duluth, Minn	2	1		3	2		2
Grand Marais, Mich		1		1	1		1
Mackinac Island, Mich		1		1			
Manistique, Mich		1		1			
Milwaukee, Wis	1	1		2	1		1
Valparaiso, Ind		1		1	7		7
Total, 1914	63	8	5	76	71	65	136
1913	25	11	87	123	111	56	167
Grand total, 1914	6,486	129	239	6,854	1,306	939	2,245
1913	3,201	139	576	3,916	1,105	322	1,427

The main object of the legislation was to promote safety of navigation at sea and on the Great Lakes; and, as the table indicates, the main efforts of the force have been turned toward ship inspections. Beside the work covered in the table, the inspectors have examined applications for the license of stations in accord with the international convention and with the act of Congress, and in the case of all ship stations and all shore stations of any considerable range have examined in detail and tested the apparatus. Based on this work the Department has issued 2,309 licenses for radio stations, a summary of which is printed in Appendix K. Examinations were held by the Bureau's inspectors of 2,245 applicants for licenses as radio operators, of whom 1,547 were found competent and licensed by the Department, as shown by the following table:

RADIO OPERATORS' LICENSES ISSUED BY RADIO INSPECTORS, FISCAL YEAR 1914.

Districts.	Grades.						Total.
	Commercial.		Experiment and instruction.	Cargo.	Amateur.		
	First.	Second.			First.	Second.	
First	....	....	....	1	21	54	76
Second	1	....	4	....	....	59	64
Third	27	3	....	6	62	187	285
Fourth	9	1	2	2	2	11	27
Fifth	6	5	....	3	8	29	51
Sixth	135	9	....	13	38	279	474
Seventh	10	1	....	1	7	43	62
Eighth	52	40	1	....	47	214	354
Ninth	21	19	3	....	27	84	154
Total, 1914	261	78	10	26	212	960	1,547
Total issued to date	2,513	393	20	129	1,319	1,737	6,114

Additional licenses issued as follows:

By Bureau of Navigation—Commercial, extra first, 1.

By Bureau of Standards—Commercial, 2; experiment and instruction, 1; amateur first, 2.

By Army and Navy—Commercial, 620; experiment and instruction, 1; cargo, 102; amateur first, 414; amateur second, 11.

About one out of every three failed to pass the examinations during the past year because the standard requirements have been raised. The corps of radio operators on shipboard within the past few years has demonstrated many times its high sense of duty, and it is the aim of the inspection service in every practical way to encourage its esprit de corps. The Bureau's inspectors in nearly every instance have themselves been operators, and are thus in a position to appreciate the conditions under which operators must do their work and to assist them in practical ways. The inspectors are also men of recognized technical attainments, and their time in part is devoted to suggesting improvements in apparatus. An instance of the value of this work is shown in the case of the small steamship *Atlantis* which went ashore about 100 miles north of Tampico in May. The radio inspector for the New Orleans district had a short time before secured improvements in the apparatus on the ship by which, at the time of the disaster, it was possible to send out calls to Navy vessels more than 100 miles distant, and 98 refugees from Mexico, including women and children, were saved.

Marine disasters continue to show the need for auxiliary wireless apparatus on shipboard, and especial attention has been given to the improvement of this apparatus. At a meeting held April 2, 1914, at the office of the Commissioner of Navigation, chairman of the committee representing the various departments of the Government concerned, of representatives of those departments and representatives of the American and British Marconi Wireless Telegraph Companies, the following propositions were unanimously agreed to:

1. That the days of the induction coil are numbered, and its use shall not be extended beyond those manufactured or now being manufactured.

2. That the plain aerial shall be abandoned and the induction coil shall be connected with the antenna through an oscillation transformer, subject to test by radio inspector in each case.

3. That a motor generator or rotary converter operated by storage battery is probably the most satisfactory means available at present of energizing the transmitting apparatus.

4. That because of the well-known reliability of the magnetic detector, its continued use be approved provided tests made with the above specified transmitting arrangements shall show that it will give clearly perceptible signals at the range required for emergency use under normal daylight conditions.

As a result of this agreement, out-of-date apparatus is now being superseded on shipboard by more efficient auxiliaries.

The art of radio communication is rapidly advancing along scientific and engineering lines. The use of apparatus for radio communication is rapidly extending on land as well as at sea. The radio telephone is now developed to such a stage that it must be given proper consideration. The high-powered stations for transoceanic service which have recently been completed or are under construction in the United States employ new inventions along the line of apparatus and long-wave lengths.

The high-powered stations comprise those of the Federal Telegraph Co., which employ the Poulsen arc system; the Marconi stations at Chatham, Belmar, and Marshalls, which employ high-speed automatic sending and receiving; the Goldschmidt station at Tuckerton, which employs a system entirely out of the ordinary.

New instruments and equipment are necessary to make measurements and tests which are beyond the range and scope of the present equipment.

Increased field force and travel allowances are necessary to meet the growing demands. More attention must be given to amateur stations on land, of which there are about 20,000. Some attention must be given to receiving stations which at present come under the law only as regards secrecy of messages. It has been possible under the present appropriation to attend to very few amateur stations; only about 5,000 have been licensed and less than 1,000 have been inspected.

It is desirable that the offices of the radio inspectors at Boston, New York, New Orleans, San Francisco, and Seattle be equipped with special apparatus which will permit the inspector to make certain measurements required by law, such as range, wave length and decrement, without going on board vessels. These equipments will also provide inspectors with a means of procuring first-hand evidence of violations of the interference and wave-length laws. These stations will also prove to be excellent control centers in cases of emergency. Assistant inspectors at these stations should be expert operators.

The following statement shows in detail the expenditures for this service during the fiscal years 1913 and 1914, the proposed distribution for the current fiscal year, and the estimates for 1916:

EXPENDITURES DURING FISCAL YEAR 1913 AND 1914, PROPOSED DISTRIBUTION DURING CURRENT FISCAL YEAR, AND ESTIMATES FOR 1916.

	1913	1914	1915	1916	Increase over 1915.
Total salaries:					
Field	$15,673.58	$24,092.50	$29,540.00	$30,440.00	$900.00
Bureau	4,328.22	5,763.75	7,150.00	8,350.00	1,200.00
Total	20,001.80	29,856.25	36,690.00	38,790.00	2,100.00
General expenses:					
Travel	4,150.93	6,044.10	5,000.00	5,000.00	
Telephone	126.84	364.71	400.00	400.00	
Laundry	22.22	127.04			
Furniture	208.21		400.00	400.00	
Supplies	923.51	636.91	450.00	450.00	
Printing	2,124.12	20.81			
New instruments	9,972.40	171.11	100.00	1,500.00	1,400.00
Repairs	20.80	46.93	1,600.00	500.00	
Telegrams	74.23	34.87	50.00	75.00	25.00
Freight	210.49	234.59	200.00	300.00	100.00
Unexpended	44.45	342.68	110.00		
Grand total	37,880.00	37,880.00	45,000.00	47,525.00	3,625.00
Decrease in repairs					1,100.00
					2,525.00

The act of 1910, as amended by the act of 1912, requiring apparatus and operators for radio communication, in the main has worked satisfactorily. Several minor amendments to the act of August 13, 1912, to regulate radio communication, are desirable to bring that act into accord with the London Radiotelegraphic Convention. It is more important, however, that some regulation of the rentals charged for radio apparatus on shipboard should be established by Congress. The reasons for this recommendation were set forth at length at pages 38 to 40 of this report for 1912, and they are confirmed by the present situation.

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RADIO COMMUNICATION.

The organization of the field force to carry out the laws relating to radio communication has been improved during the year and in consequence it has been possible to carry on more fully the inspection system through the seaboard States and the States bordering on the Great Lakes. The field force now consists of 12 inspectors, and a $900 clerk has been provided at six of the principal headquarters offices, thus enabling the inspectors to cover more territory than heretofore. The Alaska stations will be inspected as soon as a man can be spared for the purpose. The number of ship inspections this year was 6,155, compared with 6,484 for the previous year, the decrease being due to the fact that many of the large trans-Atlantic passenger liners have been withdrawn for military reasons and on account of the lack of passenger business, while smaller cargo boats not required to carry wireless apparatus and operators have taken their places in the export-carrying trade.

The inspection of ships is the most important work of this Service and it has been carried out more thoroughly this year than heretofore, although the number of inspections has been less. The number of land stations inspected was 560, compared with 368 for the previous fiscal year, and the number of operators examined as to qualifications was 3,194, compared with 2,245 for 1914. The total number of stations licensed was 4,039, compared with 2,309 during the previous fiscal year, and the total number of licenses issued to operators was 4,859, compared with 1,548 during 1914. The total number of operators licensed, including amateurs, is 10,973.

The following table shows the number of inspections of stations and the number of operators examined as to qualifications by the radio inspection force for 1915, with brief comparative figures for 1914, and indicates the extent of territory covered last year by the force:

RADIO INSPECTIONS AND EXAMINATIONS.

[District headquarters shown in small capitals.]

Ports visited.	Stations inspected.				Operators examined.		
	Ship.	Commercial and special land.	General and restricted amateur.	Total.	Commercial.	Amateur and special.	Total.
First district:							
BOSTON, MASS.	424	6	233	663	14	56	70
Danvers, Mass.	1		3	4			
Hartford, Conn.		4	6	10	4	42	46
Lowell, Mass.			5	5		8	8
Lynn, Mass.			4	4			
Northampton, Mass.		1		1			
Portland, Me.	2		23	25		15	15
Providence, R. I.			23	23		1	1
South Wellfleet, Mass.	1	1		2			
Springfield, Mass.			6	6		5	5
Worcester, Mass.			5	5		5	5
Total 1915	428	12	308	748	18	132	150
1914	910	15	95	1,020		73	73
Second district:							
NEW YORK, N. Y.	2,382	5	10	2,397			
Sayville, N. Y.		1		1			
Total 1915	2,382	6	10	2,398			
1914	2,022	15	18	2,055	1	6	7
Third district:							
BALTIMORE, MD.	402	1		403	116	367	483
Camden, N. J.	2			2			
Cape May, N. J.		1		1			
Newport News, Va.	10			10		2	2
Norfolk, Va.	21		11	32		1	1
Philadelphia, Pa.	133	8	11	152	1	17	18
Virginia Beach, Va.		1		1			
Wilmington, Del.	1			1			
Total 1915	569	11	22	602	117	387	504
1914	731	14	43	788	65	266	331
Fourth district:							
SAVANNAH, GA.	1	1		2			
Asheville, N. C.			2	2			
Jacksonville, Fla.	3	1	3	7		3	3
Key West, Fla.	2			2			
Passagrille, Fla.		3		3			
Port Tampa, Fla.	2		1	3			
St. Petersburg, Fla.		1	7	8		6	6
Tampa, Fla.	5	4	1	10		2	2
Total 1915	13	10	14	37		11	11
1914	235	16	20	271	15	13	28
Fifth district:							
NEW ORLEANS, LA.	613	11	7	631	91	34	125
Baton Rouge, La.	1			1			
Fort Morgan, Ala.		1		1			
Galveston, Tex.	23	4	4	31	3	1	4
Grand Coteau, La.		2		2			
Houston, Tex.			4	4		3	3
Lafayette, La.		1		1			
Mobile, Ala.		1		1			
Port Arthur, Tex.	24	3		27			
Texas City, Tex.	4			4	1		1
Total 1915	665	23	15	703	95	38	133
1914	724	30	45	799	22	12	34
Sixth district:							
SAN FRANCISCO, CAL.	1,517	13	12	1,542	339	299	638
Total 1915	1,517	13	12	1,542	339	299	638
1914	960	11	11	982	935	103	1,038

RADIO INSPECTIONS AND EXAMINATIONS—Continued.

Ports visited.	Stations inspected.				Operators examined.		
	Ship.	Commercial and special land.	General and restricted amateur.	Total.	Commercial.	Amateur and special.	Total.
Seventh district:							
SEATTLE, WASH	353	6	16	375	89	178	267
Bellingham, Wash	1		1	2			
Portland, Oreg	2	1	24	27			
Salem, Oreg			6	6			
Silverton, Oreg			3	3			
Total 1915	356	7	50	413	89	178	267
1914	702	2		704	36	63	99
Eighth district:							
CLEVELAND, OHIO	97	4	2	103	112	560	672
Akron, Ohio		1		1			
Ashtabula, Ohio	3	1		4		1	1
Benton Harbor, Mich		2		2			
Buffalo, N. Y	8	2		10	6	17	23
Canton, Ohio		1		1			
Cincinnati, Ohio			2	2	2	29	31
Conneaut, Ohio	5			5		19	19
Detroit, Mich	14	3		17	1	10	11
Frankfort, Mich	5	2		7		8	8
Grand Haven, Mich		2		2		2	2
Grand Rapids, Mich		1		1	3	4	7
Hamilton, Ohio			1	1		4	4
Ludington, Mich	6	2		8			
Warren, Ohio		1		1			
Wheeling, W. Va		1		1		2	2
Total 1915	138	23	5	166	124	656	780
1914	139	18	2	159	161	338	499
Ninth District:							
CHICAGO, Ill	76	4		80	113	513	626
Calumet, Mich		1		1			
Duluth, Minn	3	1		4			
Grand Marais, Minn		1		1			
Illiopolis, Ill		1		1	2		2
Indianapolis, Ind					1	24	25
Mackinac Island, Mich	2	2		4			
Manistique, Mich		2		2			
Manitowoc, Wis	2	1		3			
Milwaukee, Wis	1	1		2			
Springfield, Ill		1		1			
St. Louis, Mo		2	2	4	3	12	15
Valparaiso, Ind					43		43
Total 1915	84	17	2	103	162	549	711
1914	63	8	5	76	71	65	136
Grand total 1915	6,152	122	438	6,712	944	2,250	3,194
1914	6,486	129	239	6,854	1,306	939	2,245

The Bureau has begun to assemble records of marine casualties in which the wireless system on ships inspected by the Department contributed to the saving of life and property. Incomplete returns for the past fiscal year show 36 such casualties and in every instance the apparatus worked satisfactorily, the auxiliary set taking up the work of the communication when the main set, through the nature of the casualty, was put out of commission. Radio operators have set for themselves high standards of courage and devotion to duty.

If the pressure of business before Congress will permit, legislation is desirable to bring our laws in a few particulars into fuller accord with the provisions of the London International Radiotelegraphic Convention. The regulation of the rentals charged for radio apparatus on shipboard was recommended in this report for 1912, pages 38 to 40,[a] and again last year. Such regulation still seems desirable. In this report for 1911, pages 56 to 58,[a] reasons were given in support of the suggestion that the Government, through the Navy Department, should take over the ownership and control of all the radio stations on the seaboard communicating with vessels at sea. The events of the past year have given added force to the suggestion. On August 5, 1914, by order of the President, wireless stations were prohibited from transmitting or receiving messages of an unneutral nature, and Navy censors have since undertaken the supervision of communication through seaboard stations. The two trans-Atlantic stations, Tuckerton and Sayville, under order of the President dated September 5, 1914, were taken over by the Navy Department and their entire operation has been under Government control. This censorship of some stations and control and operation of two have, of course, involved some expense to the Government. In the event of a war involving the United States the complete operation of all coast stations would necessarily be assumed by the Government.

The following statement shows in detail the expenditures for this service during the fiscal years 1913, 1914, and 1915, the proposed distribution for the current fiscal year, and the estimates for 1917:

	1913	1914	1915	1916	1917
Total salaries:					
Field	$15,673.58	$24,092.50	$27,844.49	$28,480.00	$32,260.00
Bureau	4,328.22	5,763.75	7,150.00	7,150.00	7,150.00
Total	20,001.80	29,856.25	34,994.49	35,630.00	39,410.00
General expenses:					
Travel	4,150.93	6,044.10	6,245.52	5,000.00	6,000.00
Telephone	126.84	364.71	399.84	400.00	400.00
Laundry	22.22	127.04			
Furniture	208.21		370.26	500.00	400.00
Supplies	923.51	636.91	517.49	650.00	650.00
Printing	2,124.12	20.81	78.10		75.00
New instruments	9,972.40	171.11	312.79	1,500.00	1,500.00
Repairs	20.80	46.93	1,455.65	500.00	500.00
Telegrams	74.23	34.87	111.51	75.00	100.00
Freight and cartage	210.49	234.59	121.84	300.00	125.00
Car fare			218.03		200.00
Technical books and papers, batteries, wire, and other small materials			168.38		150.00
Unexpended	44.45	342.68	3.10	445.00	
Grand total	37,880.00	37,880.00	45,000.00	45,000.00	49,510.00

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[a] Refers to pagination in Commissioner of Navigation's separate report.

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RADIO COMMUNICATION.

During the past year wireless apparatus on board American and foreign ships was inspected by the Bureau radio inspectors shortly before the departure of the ships from ports of the United States on 7,236 occasions, compared with 6,152 occasions during the fiscal year 1915. On 434 occasions the main or auxiliary apparatus has been reported defective, requiring overhauling, and on many occasions not reported minor defects in apparatus have been remedied on the spot by the inspectors. In these times to shipwreck, fire, collision, and other maritime perils is added the danger from submarines and mines and the radio inspectors' work is correspondingly more necessary. The press almost daily carries cable or telegraph despatches of life at sea saved by wireless calls. During the past fiscal year in 69 instances ships recently inspected by the Bureau's force employed their radio apparatus either to call for help or in response to such calls to announce their coming to the rescue. The European war has compelled a great increase in the number of ships equipped with wireless, and by the British order of August 21, 1916, about 1,500 British ships of 3,000 tons or over not hitherto equipped are now required to carry apparatus and operators. The number of neutral ships engaged in ocean trade recently equipped with wireless is not stated but is reported by inspectors to be considerable. It is altogether probable that the apparatus thus installed will be retained after the special conditions requiring it have ceased. Be that as it may, the wireless inspection force ought to be increased at least to enable it to meet the present situation. The present force sufficed for inspection at about half the total clearances, but on about 5,000 occasions no inspection could be made. The estimates, accordingly, ask for an additional inspector at Savannah and near-by South Atlantic ports and additional assistant inspectors at Baltimore, Boston, New Orleans, New York, and Detroit. The standard of the inspection service is high, indeed other branches of the Government and private companies draw upon its membership every year with offers of considerably higher salaries.

The number and grade of licenses issued to operators during the past year and the previous three years are shown below:

Grade.	1913	1914	1915	1916	Total.
Commercial extra first	....	....	18	18	36
Commercial first and second	1,932	339	1,635	1,260	5,166
Experiment and instruction	8	10	27	30	75
Cargo	1	26	112	173	312
Amateur first and second	1,841	1,172	3,067	4,199	10,279
Total	3,782	1,547	4,859	5,680	15,868

During the year 5,601 licenses to stations were issued compared with 4,039 for the previous year. The classification of these stations is shown in the following table:

Class.	1915	1916	Class.	1915	1916
Commercial ship	362	444	Technical and training school	15	33
General public service land	41	51	Special amateur	37	67
Limited public service land	11	17	General and restricted amateur	3,510	4,875
Limited commercial land	22	57			
Experimental	41	57	Total	4,039	5,601

The station licenses hitherto have been issued for one year only, in view of the fact that improvements in the art have been many and rapid and changes in apparatus often required new inspections and new licenses. The standard types of apparatus for ships and amateurs are now becoming more fixed, and beginning with June 30, 1916, such licenses are now issued for two years, except in special cases. The amount of this work will be accordingly reduced.

The following statement shows in detail the expenditures for this service during the fiscal years 1913, 1914, 1915, and 1916, the proposed distribution for the current fiscal year, and the estimates for 1918:

	1913	1914	1915	1916	1917	1918
Total salaries:						
Field	$15,673.58	$24,092.50	$27,844.49	$28,379.51	$29,570.00	$36,240.00
Bureau	4,328.22	5,763.75	7,150.00	7,150.00	7,150.00	8,470.00
Total	20,001.80	29,856.25	34,994.49	35,529.51	36,720.00	44,710.00
General expenses:						
Travel	4,150.93	6,044.10	6,245.52	4,355.12	4,300.00	7,000.00
Telephone	126.84	364.71	399.84	401.81	400.00	500.00
Laundry	22.22	127.04				
Furniture	208.21		370.26	441.77	250.00	365.00
Supplies	923.51	636.91	517.49	331.90	650.00	650.00
Printing	2,124.12	20.81	78.10	116.60	100.00	150.00
New instruments	9,972.40	171.11	312.79	2,786.75	1,500.00	2,000.00
Repairs	20.80	46.93	1,455.65	109.78	250.00	500.00
Telegrams	74.23	34.87	111.51	33.47	75.00	100.00
Freight and cartage	210.49	234.59	124.84	89.34	300.00	125.00
Car fare			218.03	339.15	350.00	500.00
Technical books and papers, batteries, wire, and other small materials			168.38	57.00	105.00	200.00
Berne publications				198.91		200.00
Unexpended	44.45	342.68	3.10	208.89		
Grand total	37,880.00	37,880.00	45,000.00	45,000.00	45,000.00	57,000.00

The number of clearances of ships required to carry wireless and of the inspections of such ships, voluntarily equipped with radio apparatus during the past fiscal year, is shown by the following statement:

CLEARANCES AND INSPECTIONS OF SHIPS BY DISTRICTS UNDER WIRELESS SHIP ACTS OF 1910 AND 1912.

1916	First, Boston.	Second, New York.	Third, Baltimore.	Fourth, Savannah.	Fifth, New Orleans.	Sixth, San Francisco.	Seventh, Seattle.	Eighth, Cleveland.	Ninth, Chicago.	Total.
Clearances[a]	1,238	3,196	1,293	1,275	915	1,871	879	344	100	11,111
Inspections[a]	544	2,630	550	21	523	1,206	552	53	46	6,125
Inspections[b]	27	186	45		65	93	174	150	371	1,111
Total inspections, 1916[a, b]	571	2,816	595	21	588	1,299	726	203	417	7,236
Total inspections, 1915[a, b]	428	2,382	569	13	665	1,517	356	138	84	6,152

[a] Vessels subject to the act of June 24, 1910, amended July 23, 1912, requiring radio apparatus on certain vessels.

[b] Vessels subject to the act of Aug. 13, 1912, voluntarily equipped with radio apparatus.

The total number of inspections for the fiscal years 1913 to 1916, inclusive, is as follows: 1913, 3,201; 1914, 6,486; 1915, 6,152; 1916, 7,236; total, 23,075.

NATURE, AMOUNT, AND GEOGRAPHICAL DISTRIBUTION OF WORK PERFORMED DURING THE PAST FISCAL YEAR BY THE RADIO SERVICE, UNDER THE ACT (OF 1912) TO REGULATE RADIO COMMUNICATION.

[District headquarters are indicated by small capitals.]

Place of inspection or examination.	Stations inspected.					Amateur stations licensed.	Operators examined.							Operators licensed.						
							Commercial			Amateur.				Commercial.			Amateur.			
	Ship—Voluntary equipment.	Ship for license.	Land.	Land for license.	General and restricted amateur.		Extra first.	First.	Second.	First.	Second.	Cargo.	Experimental and instruction.	Extra first.	First.	Second.	First.	Second.	Cargo.	Experimental and instruction.
First district:																				
BOSTON, MASS.	22	14	7	5	81	677	......	55	12	208	164	11	......	......	53	10	330	221	10	......
Bar Harbor, Me.	......	......	......	......	5	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Greenwich, Conn.	......	......	......	......	8	1	......	......	......	6	1	......	......	......	......	......	......	2	......	......
Hartford, Conn.	......	......	3	......	2	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
New Haven, Conn.	......	......	......	......	17	39	......	......	......	17	11	......	......	......	......	......	6	16	......	......
New London, Conn.	......	......	2	1	6	......	......	......	......	1	......	......	......	......	......	......	1	......	......	......
Noroton Heights, Conn.	......	......	......	......	3	4	......	......	......	3	......	......	......	......	......	......	......	......	......	......
Orona, Me.	......	......	1	......	2	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Portland, Me.	2	......	1	......	27	13	......	1	......	16	1	......	......	......	......	......	5	2	......	......
Portsmouth, N. H.	......	......	......	......	3	......	......	1	......	1	......	......	......	......	1	......	1	......	......	......
Providence, R. I.	3	......	2	1	3	......	......	......	......	8	1	......	......	......	......	......	6	4	......	......
Rockland, Me.	......	......	1	......	6	5	......	......	......	......	1	......	......	......	......	......	......	3	......	......
South Norwalk, Conn.	......	......	......	......	5	......	......	......	......	4	......	......	......	......	......	......	......	......	......	......
Stamford, Conn.	......	......	......	......	11	1	......	......	......	9	1	......	......	......	......	......	......	1	......	......
Westerly, R. I.	......	......	......	......	15	4	......	1	......	4	......	......	......	......	......	......	......	......	......	......
Total	27	14	17	7	194	744	......	58	12	367	180	11	......	......	54	10	349	249	10	......
Second district:																				
NEW YORK, N. Y.	186	185	15	10	10	690	......	......	......	......	140	......	3	......	69	......	17	149	......	3
Binghamton N Y.	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Scranton, Pa.	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Total	186	185	15	12	10	690	......	......	......	......	149	......	3	......	60	......	17	149	......	3
Third district:																				
BALTIMORE, MD.	25	21	......	1	28	534	......	36	2	85	140	5	2	......	27	2	89	142	5	3
Newport News, Va.	4	1	......	......	......	28	......	......	......	2	3	......	......	......	......	......	2	3	......	......
Norfolk, Va.	8	2	1	1	......	63	......	1	......	8	12	......	......	......	1	......	8	12	......	......
Philadelphia, Pa.	8	12	19	2	4	121	......	1	......	10	24	......	......	......	1	......	19	24	......	......
Washington, D. C.	......	......	5	......	21	27	......	1	......	4	7	......	......	......	1	......	4	7	......	......

Wilmington, Del.		2		2		10				1	3						1	3		
Total	45	38	25	6	53	783		39	2	119	195	5	2		30	2	123	191	5	3
Fourth district:																				
SAVANNAH, GA						86					81							81		
Fifth district:																				
NEW ORLEANS, LA	61	25	1	12	1	98	4	43		16	103	15	1	1	47	5	17	103	14	1
Beaumont, Tex			2											1						
Fort Morgan, Ala				1																
Galveston, Tex	1	2		1		3					3							3		
Mobile, Ala				1	1															
Port Arthur, Tex	3	6		3																
Total	65	33	3	18	2	101	4	43		16	106	15	1	2	47	5	17	106	14	1
Sixth district:																				
SAN FRANCISCO, CAL	91	39	3	2	6	524	3	179	39	149	271	12	1	2	148	34	132	267	10	
Eureka, Cal	2		1		1															
Los Angeles, Cal			3	1	14			27	5	62					23	6	69			
San Diego, Cal			1		1			5		16										
Total	93	39	8	3	22	524	3	211	44	227	271	12	1	2	171	40	201	267	10	
Seventh district:																				
SEATTLE WASH	174	51	17	6	1	213	2	61	17	49	163	5			74	23	67	163	5	
Portland, Oreg			5	3	19			16	14	25					2					
St. Johns, Oreg					7															
Vancouver, Wash					3															
Total	174	51	22	9	30	213	2	77	31	74	163	5			76	23	67	163	5	
Eighth district:																				
CLEVELAND, OHIO	139	3	2		1	851		43	19	150	433		12		37	19	143	614		12
Ashtabula, Ohio		1		1						7	15						7	25		
Buffalo, N. Y	1				10	13		3	2	19						3	12	12		
Conneaut, Ohio	1	2		1																
Detroit, Mich	8	5	4			60		9	7	37	30				6	3	24	44		
Mount Clemens, Mich					6					6							5			
Port Huron, Mich		2			9	38				7	15						7	25		
Richmond, Mich					4	11												6		
St. Clair, Mich	1	2																		
Total	150	15	6	2	30	973		55	28	226	493		12		43	25	198	726		12
Ninth district:																				
CHICAGO, ILL	371	30	3		79	761		109	20	195	434		8		65	32	136	606		8
Totals by districts:																				
First	27	14	17	7	104	744		58	12	367	180	11			54	10	349	249	10	
Second	186	185	15	12	10	690					149		3		69		17	149		3
Third	45	33	24	6	53	783		39	2	119	195	5	2		30	2	123	191	5	3

NATURE, AMOUNT, AND GEOGRAPHICAL DISTRIBUTION OF WORK PERFORMED DURING THE PAST FISCAL YEAR BY THE RADIO SERVICE, UNDER THE ACT (OF 1912) TO REGULATE RADIO COMMUNICATION—Continued.

Place of inspection or examination.	Stations inspected.					Amateur stations licensed.	Operators examined.							Operators licensed.						
	Ship—Voluntary equipment.	Ship for license.	Land.	Land for license.	General and restricted amateur.		Commercial			Amateur.		Cargo.	Experimental and instruction.	Commercial.			Amateur.		Cargo.	Experimental and instruction.
							Extra first.	First.	Second.	First.	Second.			Extra first.	First.	Second.	First.	Second.		
Totals by districts—Continued.																				
Fourth	......	......	......	......	......	86	......	......	......	......	81	......	......	......	......	......	......	81	......	......
Fifth	65	33	3	18	2	101	4	43	......	16	106	15	1	2	47	5	17	106	14	1
Sixth	93	39	8	3	22	524	3	211	44	227	271	12	1	2	171	40	201	267	10	......
Seventh	174	51	22	9	30	213	2	77	31	74	163	5	......	......	76	23	67	163	5	......
Eighth	150	15	6	2	30	973	......	55	28	226	493	......	12	......	43	25	198	726	......	12
Ninth	371	30	3	......	79	761	......	109	20	195	434	......	8	......	65	32	136	606	......	8
Total	1,111	400	98	57	420	4,875	9	592	137	1,224	2,072	48	27	4	555	137	1,108	2,538	44	27
Operator licenses issued by Army and Navy	......	......	......	......	......	......	......	......	......	......	......	......	......	9	452	116	551	2	129	2
Grand total	......	......	......	......	......	......	......	......	......	......	......	......	......	13	1,007	253	1,659	2,540	173	29

INTERNATIONAL CONFERENCE.

The next international radiotelegraphic conference was to have been held in 1917, and at the London conference of 1912 the American delegation, with the consent of the State Department, secured the approval by the conference of Washington as the next meeting place. The European war, of course, will prevent the meeting in 1917 and possibly for several years.

Selection from

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RADIO COMMUNICATION.

Submarine assaults have required radio inspectors to give special attention to the radio equipment on vessels entering the war zone. During the past fiscal year there were 12,139 clearances of radio-equipped vessels coming under the act of June 24, 1910, amended July 23, 1912, and 6,103 inspections were made of the radio equipment on these vessels as compared with 11,111 clearances and 6,125 inspections during the fiscal year 1916. These inspections disclosed 502 cases where the equipment did not comply with the requirements of the law or where no equipment at all had been provided. Of these cases, 278 were found on foreign vessels and 143 on American vessels. A great many minor defects were noted but were remedied by the inspectors at the time of inspections.

The small decrease in the number of inspections is due to the many changes in the inspection force, as all of the original inspectors in the field service voluntarily entered the service of the Army and Navy as reserve officers, necessitating the employment of new men unfamiliar with the duties. Two of the inspectors entered the service of the Army, one receiving the rank of major and one of captain; nine entered the service of the Navy, four receiving the rank of lieutenant, three of lieutenant junior grade, and two of ensign.

During the fiscal year many vessels equipped with radio apparatus have been sunk. The value of this apparatus is illustrated in the following extract from the log of an American vessel:

> *July 4, 1917.*—Chased by submarine. Got into communication with British destroyer by wireless. Fired three shots at submarine. Destroyer to our assistance. Submarine disappeared.
>
> *July 5, 1917.*—Heard shots being fired about 8 a. m. and picked up distress from British ship saying she was being shelled. 8.30 a. m., saw sailing ship blown up about 3 miles ahead of us. 9.45, chased by submarine. Got into communication with two British destroyers and French land station. They sent an aeroplane to our assistance in response to our distress call. Submarine submerged. Fog came up. 3.30 p. m., fog lifted. Submarine 2 miles from us opened fire upon us. Got into communication with land station and several destroyers answered, saying they were coming to our assistance. Battle lasted 55 minutes. Submarine sunk by our gun fire. Fragment of shell struck our stern plates, requiring 79 rivets when we reached France.
>
> *July 27, 1917.*—Sailed for New York.
>
> *July 30, 1917—4.30 a. m.*—Picked up 23 survivors of the torpedoed British ship ———. Sent code message asking a destroyer to relieve us of them, as we had only a sufficient number of lifeboats for our own crew. 10 a. m., relieved of ——— survivors by British patrol.
>
> *August 1, 1917.*—Ship took fire. Burning oil for fuel. Sent distress call. All hands to lifeboats. Rescued by Greek ship ———. Taken to ———, ———. Returned to New York on American steamship ———.

The Navy Department, acting under authority of an Executive order, dated April 6, 1917, ordered the closing of the 6,089 licensed amateur transmitting radio stations and also all amateur receiving stations and such commercial radio stations as were not required for naval communication.

At the beginning of the war a heavy demand for commercial operators was made by the War and Navy departments, and the large reserve of amateur radio operators made it possible to supply the increased demand. By consulting the lists of licensed amateur radio stations it was possible to communicate with practically every available amateur radio operator in the United States within a short time.

All of the radio inspectors are making special efforts to supply the unusual demand for commercial operators. To accomplish this they are acting as instructors in radio schools, lecturing in radio clubs, and canvassing their districts through correspondence, which is resulting in a large number of amateurs and those who have not heretofore been interested in radiotelegraphy obtaining the necessary knowledge to pass the commercial examinations. The Bureau is directing its radio inspectors to visit all of the important cities throughout the country whenever there is a class of students prepared to take its examinations. This has resulted in securing 680 new commercial operators between April 1 and June 30, or from the time this country entered the war to the end of the fiscal year.

Mr. Marconi, referring to amateur radio operators, says:

> America is fortunate in having perfected its organization of the amateur field. * * * American wireless men are exceptionally well qualified to take an active part in important signaling work. Much valuable material will be found in the amateur ranks, as these young men are accustomed to transmission on short wave lengths. A great deal of our communication is carried on with low power and wave lengths in the neighborhood of 200 meters—the exact type of communication to which they are most accustomed.

The number and grade of licenses issued to operators during the past year and previous four years is shown below.

Grade.	1913	1914	1915	1916	1917	Total.
Commercial extra first			18	18	8	44
Commercial first and second	1,932	339	1,635	1,260	1,674	6,840
Experiment and instruction	8	10	27	30	10	85
Cargo	1	26	112	173	113	425
Amateur first and second	1,841	1,172	3,067	4,199	3,302	13,581
Commercial emergency first and second	......	......	......	......	217	217
Total	3,782	1,547	4,859	5,680	5,324	21,192

During the past fiscal year 4,417 licenses to stations were issued, compared with 5,601 for the previous year. Classification of these stations is shown in the following table:

Class.	1916	1917	Class.	1916	1917
Commercial ship	444	484	Technical and training school	33	32
General public service land	51	44	Special amateur	67	54
Limited public service land	17	20	General and restricted amateur	4,875	3,687
Limited commercial land	57	46			
Experimental	57	50	Total	5,601	4,417

The decrease in the number of station licenses issued is due to the discontinuance of licensing land stations, including amateur stations, at the beginning of the war. The total number of station licenses issued for the fiscal years 1913 to 1917, inclusive, is as follows: 1913, 1,496; 1914, 2,309; 1915, 4,039; 1916, 5,601; 1917, 4,417; total, 17,862.

The statement following shows details of expenditures for this service during the fiscal years 1913, 1914, 1915, 1916, and 1917; the proposed distribution for the current fiscal year; and the estimates for 1919:

	1913	1914	1915	1916	1917	1918	1919
Total salaries:							
Field	$15,673.58	$24,092.50	$27,844.49	$28,379.51	$27,784.66	$31,880.00	$31,880.00
Bureau	4,328.22	5,763.75	7,150.00	7,150.00	7,013.34	8,050.00	8,050.00
Total	20,001.80	29,856.25	34,994.49	35,529.51	34,798.00	39,930.00	39,930.00
General expenses:							
Travel	4,150.93	6,044.10	6,245.52	4,355.12	2,317.42	2,000.00	2,000.00
Telephone	126.84	364.71	399.84	401.81	565.88	600.00	600.00
Laundry	22.22	127.04					
Furniture	208.21		370.26	441.77	151.64	150.00	150.00
Supplies	923.51	636.91	517.49	331.90	558.76	500.00	500.00
Printing	2 124.12	20.81	78.10	116.60	68.79	75.00	75.00
New instruments	9,972.40	171.11	312.79	2,786.75	2,741.09	1,000.00	1,000.00
Repairs	20.80	46.93	1,455.65	109.78	83.05	78.00	78.00
Telegrams	74.23	34.87	111.51	33.47	24.33	25.00	25.00
Freight and cartage	210.49	234.59	124.84	89.34	63.23	65.00	65.00
Car fare			218.03	339.15	330.16	350.00	350.00
Technical books and papers, batteries, wire, and other small materials			168.38	57.00	47.30	50.00	50.00
Berne publications				198.91	13.74	15.00	15.00
Rent					98.75	162.00	162.00
Unexpended	44.45	342.68	3.10	208.89	3,137.86		
Grand total	37,880.00	37,880.00	45,000.00	45,000.00	45,000.00	45,000.00	45,000.00

The number of clearances of ships required to carry wireless and of the inspections of such ships is shown by the following statement:

Clearances and Inspections of Vessels Subject to the Ship Act of June 24, 1910, as Amended July 23, 1912, During the Fiscal Year 1917.

[District headquarters are indicated by small capitals.]

District.	Port.	Clearances.	Inspections.	District.	Port.	Clearances.	Inspections.
1st	BOSTON, MASS.	990	721	5th	Port Arthur, Tex.	58	0
	Portland, Me.	151	8	6th	SAN FRANCISCO, CAL.	1,156	1,060
	Providence, R. I.	134	1		Eureka, Cal.	57	0
2d	NEW YORK, N. Y.	3,065	2,296		Honolulu, Hawaii.	210	0
	Perth Amboy and Newark, N. J.	15	0		Los Angeles, Cal.	316	0
					San Diego, Cal.	161	0
3d	BALTIMORE, MD.	454	430	7th	SEATTLE, WASH.	487	507
	Newport News, Va.	381	104		Astoria, Oreg.	131	0
	Norfolk, Va.	1,036	360		Ketchikan, Alaska.	335	0
	Philadelphia, Pa.	232	40		Portland, Oreg.	127	0
4th	SAVANNAH, GA.	385	4		Tacoma, Wash.	29	0
	Charleston, S. C.	207	3	8th	DETROIT, MICH.	169	44
	Key West, Fla.	289	3		Buffalo, N. Y.	183	3
	Pensacola, Fla.	7	0	9th	CHICAGO, ILL.	89	66
	San Juan, P. R.	267	0		Duluth, Minn.	62	1
	Tampa, Fla.	202	0				
5th	NEW ORLEANS, LA.	487	448		Total, 1917	12,139	6,103
	Galveston, Tex.	232	4		Total, 1916	11,111	6,125
	Mobile, Ala.	35	0				

The total number of ship inspections for the fiscal years 1913 to 1917, inclusive, is as follows: 1913, 3,201; 1914, 6,486; 1915, 6,152; 1916, 7,236; 1917, 7,137; total, 30,212.

The following is a classified list of the defects found during the fiscal year in radio stations on board ship for which official notices were served on the masters by radio inspectors, requiring that the deficiencies be remedied prior to the sailing of the vessels. In each case the radio inspector took the necessary steps to place the station in proper condition before sailing, thus preventing a violation of the law.

Defects noted.	Number.
Inefficient auxiliary apparatus, inefficient auxiliary source of power supply, or lack of same	149
Inefficient main transmitter used as auxiliary transmitter	26
Inefficient means of communication between the radio room and the bridge or lack of same	211
Improper complement of radio operators	87
Inefficient receiving set or lack of same	21
Lack of radio equipment where required	8
Total number of defects noted	502

NATURE, AMOUNT, AND GEOGRAPHICAL DISTRIBUTION OF WORK PERFORMED DURING THE PAST FISCAL YEAR, AS COMPARED WITH THE FISCAL YEAR 1916, BY THE RADIO SERVICE, UNDER THE ACT (OF 1912) TO REGULATE RADIO COMMUNICATION.

[District headquarters are indicated by small capitals.]

Place of inspection or examination.	Stations inspected.					Amateur stations licensed.	Operators examined.							Operators licensed.						
							Commercial.			Amateur.				Commercial.			Amateur.			
	Ship—Voluntary equipment.	Ship for license.	Land.	Land for license.	General and restricted amateur.		Extra first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.	Extra first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.
First district:																				
BOSTON, MASS	67	22	1	1	14	610	2	155	28	·290	135	23	0	1	179	25	355	209	23	0
Bridgeport, Conn								5	5						5	4				
Brockton, Mass					13															
Fall River, Mass		1			1															
Hartford, Conn								5	19						5	15				
New Britain, Conn								4	4						4	2				
Newport, R. I				1																
Portland, Me					14			4		5					3	1	5			
Providence, R. I		2		1				8	10						5	8				
Salem, Mass					3															
Tuft's College, Mass				1																
Waterbury, Conn								2	3						2	3				
Total, 1917	67	25	1	4	45	610	2	183	69	205	135	23	0	1	[a] 203	[b] 58	360	209	23	0
Total, 1916	27	14	17	7	104	744	0	58	12	367	180	11	0	0	54	10	349	249	10	0
Second district: NEW YORK, N. Y.:																				
Total, 1917	44	82	10	1	12	583	3	192	92	110	189	56	0	0	[c] 286	[d] 99	129	189	49	0
Total, 1916	186	185	15	12	10	690	0	0	0	0	149	0	3	0	69	0	17	149	0	3
Third district:																				
BALTIMORE, MD	78	35	3	5	33	428	1	72	3	86	104	13	2	1	102	12	106	105	14	2
Norfolk and Newport News, Va	173	5	1	1	24			21		7		3			23		2		3	
Philadelphia, Pa	3	7	6	3	7			18	3	50			2		6					
Total, 1917	254	47	10	9	64	428	1	111	6	143	104	16	4	1	[e] 131	[f] 12	108	105	17	2
Total, 1916	45	38	25	6	53	783	0	39	2	110	95	5	2	0	30	2	123	191	0	3

[a] Includes 35 emergency licenses.
[b] Includes 33 emergency licenses.
[c] Includes 10 emergency licenses.
[d] Includes 15 emergency licenses.
[e] Includes 14 emergency licenses.
[f] Includes 2 emergency licenses.

NATURE, AMOUNT, AND GEOGRAPHICAL DISTRIBUTION OF WORK PERFORMED DURING THE PAST FISCAL YEAR, AS COMPARED WITH THE FISCAL YEAR 1916, BY THE RADIO SERVICE, UNDER THE ACT (OF 1912) TO REGULATE RADIO COMMUNICATION—Continued.

Place of inspection or examination.	Stations inspected.					Amateur stations licensed.	Operators examined.							Operators licensed.						
							Commercial.			Amateur.				Commercial.			Amateur.			
	Ship—Voluntary equipment.	Ship for license.	Land.	Land for license	General and restricted amateur.		Extra first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.	Extra first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.
Fourth district:																				
SAVANNAH, GA.			1	1		76				2	74					1	5	74		
Charleston, S. C.				1																
Jacksonville, Fla.			1	1																
Key West, Fla.	1	5			2			1	1											
Miami, Fla.				1			1			1										
Tampa, Fla.	1		1		7			3	1	2										
Total, 1917	2	5	3	4	9	76	1	4	2	5	74	0	0	0	0	1	5	74	0	0
Total, 1916	0	0	0	0	0	86	0	0	0	0	81	0	0	0	0	0	0	81	0	0
Fifth district:																				
NEW ORLEANS, LA.	54	19	3	2	11	79	10	55	1	13	76	12		4	75	6	13	76	9	1
Amesville, La.	1	1																		
Beaumont, Tex.			3	1																
Burrwood, La.				1							1							1		
Galveston, Tex.	5	2		1				1												
Meraux, La.		1																		
Mobile, Ala.			3																	
Port Arthur, Tex.	7	1	1																	
Total, 1917	67	24	10	5	11	79	10	56	1	13	77	12	0	4	75	6	13	77	9	1
Total, 1916	65	33	3	18	2	101	4	43	0	16	106	15	1	2	47	5	17	106	14	1
Sixth district:																				
SAN FRANCISCO, CAL.	159	51	5	6	2	402	1	209	14	68	197	9	0	0	237	24	70	197	9	0
Douglas, Ariz.				1																
Hollister, Cal.			1																	
Los Angeles, Cal.		2	4	1				31	5	100					17	14	94			
Phoenix, Ariz.				1				1												
San Diego, Cal.				1				5	3	7										
San Pedro, Cal.	2	2		1																
Total, 1917	161	55	10	11	2	402	1	246	22	175	197	9	0	0	a 254	b 38	164	197	9	0
Total, 1916	93	39	8	3	22	524	3	211	44	227	271	12	1	2	171	40	201	267	10	4

Seventh district:																				
SEATTLE, WASH.	100	47	10	3	......	184	0	96	16	28	125	7	1	1	132	22	43	125	6	1
Portland, Oreg.	2	......	2	2	2	......	......	21	14	21	......	......	......	......	......	......	......	......	......	......
Vancouver, Wash.	......	......	1	1	4	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Total, 1917	102	47	13	6	6	184	0	117	30	49	125	7	1	1	[c] 132	22	43	125	6	1
Total, 1916	174	51	22	9	30	213	2	77	31	74	163	5	0	0	76	23	67	163	5	0
Eighth district:																				
DETROIT, MICH.	65	15	3	2	......	659	......	54	20	46	263	......	2	......	17	32	55	543	......	4
Buffalo, N. Y.	5	4	1	1	......	......	......	17	9	36	......	......	......	......	6	10	25	......	......	......
Cincinnati, Ohio	......	......	......	......	......	......	......	11	12	......	......	......	......	......	......	16	......	......	......	......
Cleveland, Ohio	6	1	2	1	......	......	1	40	3	29	......	......	......	1	7	18	27	......	......	......
Frankfort, Mich.	......	1	......	1	......	......	......	2	......	......	......	......	......	......	2	......	......	......	......	......
Grand Haven, Mich.	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Ludington, Mich.	......	2	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Pittsburgh, Pa.	......	......	......	......	......	......	......	22	11	......	......	......	......	......	4	21	......	......	......	......
Toledo, Ohio	......	......	......	......	......	......	......	13	7	......	......	......	......	......	3	8	......	......	......	......
Total, 1917	76	23	6	7	0	659	1	159	62	111	263	0	2	1	[d] 39	[e] 105	107	543	0	4
Total, 1916	150	15	6	2	30	973	0	55	28	226	493	0	12	0	43	25	198	726	0	12
Ninth district:																				
CHICAGO, ILL.	261	18	0	4	9	666	1	177	54	144	344	0	3	0	99	92	116	541	0	7
Calumet, Mich.	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Davenport, Iowa	......	......	1	......	......	......	......	......	3	18	......	......	......	......	......	2	13	......	......	......
Duluth, Minn.	......	......	......	1	......	......	......	5	3	17	......	......	......	......	1	3	9	......	......	......
Indianapolis, Ind.	......	......	......	......	1	......	......	7	2	38	......	......	......	......	......	2	35	......	......	......
Mackinac Island, Mich.	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Manistique, Mich.	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Manitowoc, Wis.	......	1	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Milwaukee, Wis.	......	1	1	1	3	......	......	10	7	53	......	......	......	......	2	6	43	......	......	......
Minneapolis, Minn.	......	......	......	......	......	......	......	2	6	......	......	......	......	......	2	1	......	......	......	......
Rock Island, Ill.	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
St. Louis, Mo.	......	......	......	......	3	......	......	4	2	39	......	......	......	......	......	3	37	......	......	......
Total, 1917	261	20	3	10	16	666	1	205	77	309	344	0	3	0	[f] 104	[g] 109	253	541	0	7
Total, 1916	371	30	3	0	79	701	0	100	20	196	434	0	8	0	65	32	136	606	0	8
SUMMARY.																				
First district	67	26	1	4	46	610	2	183	60	295	135	23	0	1	203	58	360	200	23	0
Second district	44	82	10	1	12	583	3	192	92	110	180	56	0	0	286	99	126	189	49	0
Third district	254	47	10	9	64	428	1	111	6	143	104	16	4	1	131	12	168	105	17	2
Fourth district	2	5	3	4	9	76	1	4	2	5	74	0	0	0	0	1	5	74	0	0
Fifth district	67	24	10	5	11	79	10	56	1	13	77	12	0	4	75	6	13	77	9	1
Sixth district	161	55	10	11	2	402	1	246	22	175	197	9	0	0	254	38	164	197	9	0
Seventh district	102	47	13	6	6	184	0	117	30	49	125	7	1	1	132	22	43	125	6	1
Eighth district	76	23	6	7	0	659	1	159	62	111	263	0	2	1	39	105	107	543	0	4
Ninth district	261	20	3	10	16	666	1	205	77	309	344	0	3	0	104	109	253	541	0	7
Grand total, 1917	1,034	328	66	57	165	3,687	20	1,273	361	1,210	1,508	123	10	8	[h] 1,224	450	1,242	2,060	113	15
Grand total, 1916	1,111	400	98	57	420	4,875	9	592	137	1,224	2,072	48	27	4	555	137	1,108	2,538	44	27

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[a] Includes 13 emergency licenses.

[b] Includes 5 emergency licenses.

[c] Includes 5 emergency licenses.

[d] Includes 4 emergency licenses.

[e] Includes 39 emergency licenses.

[f] Includes 12 emergency licenses.

[g] Includes 32 emergency licenses.

[h] Includes 93 emergency licenses.

[i] Includes 124 emergency licenses.

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RADIO COMMUNICATION.

Upon the declaration of war 18 of the 25 men in the radio inspection force volunteered and were commissioned as officers in the Army and Navy. They have served with credit in responsible positions which called for their technical knowledge with our expeditionary forces in France, at sea, and wherever assigned to duty. During the year ended June 30, 1918, the work was carried on by substitutes and these have been leaving to enter the military and naval service. The demand for radio apparatus for the Navy and for new merchant ships has been very heavy, and to economize resources it was arranged that the Navy Department should allot such apparatus to its own ships and to merchant ships and later that the Navy should keep in repair apparatus for Shipping Board ships as well as for the Navy. This arrangement and the obvious fact that enough apparatus to comply in all respects with the laws could not be produced led to a change in the inspection system in November, 1917. Inspection of merchant ships furnished with apparatus on naval allotment was discontinued except in so far as it is continued by the Navy, which makes the repairs. As practically all British, French, Italian, Japanese, and other allied ships and their radio apparatus and operators are under control of the military branches of their respective governments, the inspection in American ports was accordingly modified. The number of inspections of ships, accordingly, was 4,341 out of 9,706 clearances compared with 6,103 out of 12,139 clearances during the previous year.

The number of clearances of ships required to carry wireless and of the inspection of such ships is shown by the following statement:

CLEARANCES AND INSPECTIONS OF VESSELS SUBJECT TO THE SHIP ACT OF JUNE 24, 1910, AS AMENDED JULY 23, 1912, DURING THE FISCAL YEAR 1918.

[District headquarters are indicated by small capitals.]

District.	Port.	Clearances.	Inspections.	District.	Port.	Clearances.	Inspections.
1st	BOSTON, MASS	742	674	6th	SAN FRANCISCO, CAL	1.031	659
	Portland, Me	96	....		Eureka, Cal	17	....
	Providence, R. I	90	....		Honolulu, Hawaii	213	....
2d	NEW YORK, N. Y	2,425	1.468		Los Angeles, Cal	253	....
	Perth Amboy and Newark, N. J	13	....		San Diego, Cal	116	....
3d	BALTIMORE, MD	167	103	7th	SEATTLE, WASH	378	298
	Newport News, Va	175	66		Astoria, Oreg	62	....
	Norfolk, Va	757	486		Bellingham, Wash	11	....
	Philadelphia, Pa	348	44		Cordova, Alaska	5	....
4th	SAVANNAH, GA	342	....		Juneau, Alaska	2	....
	Brunswick, Ga	11	....		Ketchikan, Alaska	273	....
	Charleston, S. C	180	....		Portland, Oreg	99	....
	Key West, Fla	190	....		Sulzer, Alaska	5	....
	Pensacola, Fla	12	....		Tacoma, Wash	43	....
	San Juan, P. R	252	....	8th	DETROIT, MICH	216	92
	Tampa, Fla	108	....		Buffalo, N. Y	199	7
5th	NEW ORLEANS, LA	506	394	9th	CHICAGO, ILL	72	43
	Galveston, Tex	158	7		Duluth, Minn	53	....
	Mobile, Ala	11	....		Total, 1918	9,706	4,341
	Pascagoula, Miss	3	....		Total, 1917	12,139	6,103
	Port Arthur, Tex	72	....				

The total number of ship inspections for the fiscal years 1913–1918, inclusive, is as follows: 1913, 3,201; 1914, 6,486; 1915, 6,152; 1916, 7,236; 1917, 7,137; 1918, 5,775; total, 35,987.

During the year 392 ship-station licenses were issued compared with 484 during the previous year, although the number of such stations has increased rapidly, as shown, by about 1,500 radio letters issued to ships and only 839 outstanding ship licenses. This work is in arrears under the present arrangement and can not be brought to date until the information about apparatus necessary to conform to the International Convention and the act of Congress has been given and the inspections made.

During the year 1,942 licenses were issued to commercial operators of various grades. The number and grade of licenses issued or renewed during the past six years were as follows:

Grade.	1913	1914	1915	1916	1917	1918	Total.
Commercial extra first	....	....	18	18	8	13	57
Commercial first and second	1,932	339	1,635	1,260	1,674	1,603	8,443
Experiment and instruction	8	10	27	30	10	(a)	85
Cargo	1	26	112	173	113	107	532
Amateur first and second	1,841	1,172	3,067	4,199	3,302	(a)	13,581
Commercial emergency first and second	....	....	....	....	217	219	436
Total	3,782	1,547	4,859	5,680	5,324	1,942	23,134

Discontinued for the period of the war.

The total number of licensed American commercial operators of various grades at the end of the year was approximately 3,200.

The prosecution of the war demands a large increase in the number of radio operators, and in addition to their statutory duties the radio inspectors have aided in training young men for the work. At Boston, with the cooperation of the Massachusetts Committee on Public Safety, the collector of customs, and others, the radio inspector has established a school from which during the year 200 students were graduated into the Army or Navy. At Detroit, working with the Young Men's Christian Association, the inspector established a similar school, from which 131 were sent to the Army or Navy and 95 were graduated as commercial operators. The inspectors at New Orleans and Norfolk conduct similar schools, and at New York and Seattle the inspectors devote their time outside of official work to instruction in radio telegraphy in the local schools.

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RADIO COMMUNICATION.

During most of the past fiscal year the war conditions described in the report for 1918 have continued with practically no change. Under the Executive order of April 30, 1917, "to insure the proper conduct of the war against the Imperial German Government and the successful termination thereof" coast radio stations were operated by the Navy Department or closed, and the order is in force at this writing, pending ratification of the treaty of peace. The Navy Department continued the supervision of the allotment of radio apparatus to ship and shore stations, and it supplied naval radio operators to many ships.

The chief inspector, inspectors, and assistant inspectors who volunteered in April, 1917, continued with the American Expeditionary Forces in France or with the American Navy in European or home waters, and the worth of their technical services during the war has been recognized by promotions and by the award of decorations by the American and by the allied Governments. The former chief inspector (Lieut. Col. Louis R. Krumm) was in charge of the wireless operations of the American armies in France, an inspector (Maj. John L. Dillon) was in charge of the wireless operations of the artillery of the first Army in France, another inspector (Lieut. H. C. Gawler) was in charge of the wireless operations at the naval base in the Azores, and other members of the inspection force satisfactorily performed the less conspicuous military and naval duties in the line of their experience assigned to them with the armed forces.

The regular work of the inspection service was continued in the meantime by assistant inspectors promoted on the personal understanding voluntarily entered into that on the return of the inspectors serving with our armed forces in France and at sea they would yield their positions and return to their former status. The number of inspections of ship stations before clearance was 4,243, compared with 4,341 during the fiscal year 1918, with 6,103 during 1917 and 6,125 during 1916. Had the radio laws been in full operation, the number of inspections would have been much larger than in these earlier years. Many American ships were supplied with apparatus under distribution by the Navy and manned with naval radio operators, and for the time being the Navy was, in fact, responsible, in so far as any branch of Government is responsible, for the efficiency of such apparatus and operators. Even if the force of inspectors had been large enough and strong enough to carry out the inspection laws in full, of course, under the conditions that work would not have been undertaken. In the same way the wireless apparatus and operators on many foreign ships were temporarily supplied or controlled by their respective admiralty or navy departments, and, as a rule, were not closely inspected here as in ordinary times and under ordinary conditions. In addition to the foregoing, 954 inspections were made of apparatus on ships voluntarily equipped, compared with 1,434 during the year 1918.

The number of applicants examined for commercial operators' licenses was 2,426 during the past year, compared with 2,514 during 1918; but, in addition, 314 applicants were examined briefly for emergency permits permitting them to sail one voyage. The number of commercial operators licensed was 1,658 during the past year and 1,881 during the previous year. The service has been confronted throughout the war by the great need of skilled operators, in view of the heavy demands of the Army and Navy for qualified men. The question of a reduction of the standards of skill was decided adversely because the American radio operator's commercial license now ranks high abroad, as well as at home. To meet the need of operators, emergency permits were issued enabling an applicant who had fair but not standard attainments to take a ship on one voyage and perfect himself and on his return to try the examination again. In addition to their official work, several of the inspectors for much over a year up to the signing of the armistice in November devoted their time after office hours to teaching radiotelegraphy in classes or institutions established by local or private organizations to aid the winning of the war.

The number of ship stations licensed was only 250 during the past year and 196 during the previous year. This work is very much in arrears, as the number of American ship stations increased from 1,478 at the beginning of the fiscal year to 2,312 on June 30, 1919, and is now increasing at the average rate of nearly 100 a month.

CURRENT CONDITIONS.

At the beginning of the current fiscal year nearly all the inspection force who had been serving with the Army in France or with the Navy in foreign or domestic waters were honorably discharged and had returned to their posts in the Service. During the war, radio communication on land and sea developed almost as rapidly as flying in the air, both in the extent of its uses and application and in invention and the mechanical improvement of apparatus and methods. In these developments and in the practical application of them under the trying conditions of warfare, the inspectors who resigned from the Radio Service of the Department of Commerce and volunteered in the Army or Navy within a week after our declaration of war have taken active and creditable parts, recognized by our own and allied Governments. They are specially qualified both by their former experience with the Bureau's Service, and by what they have done and learned during the war, to conduct the radio-inspection service upon which the volume of demands has been increased by great war appropriations for ships and the technical requirements extended by the inventions and improvements of the war. This is not the place and I am not the man to attempt more than the barest enumeration of some of these changes. Before the war transoceanic radio communication was experimental; now it is an everyday commercial affair across the Atlantic and the Pacific. Aviation before the war was virtually limited to inventors and men of considerable wealth and courage; it is now taking its place in commercial life, and wireless furnishes the means of communication between the flyer and those on land or sea. Very much of the communication between the armies on all fronts and their commanders was maintained by radio, and a great extension in wireless commercial communication on land is inevitable. Radiotelephony is a natural development of radiotelegraphy.

COST OF RADIO SERVICE.

The total annual appropriation for the past five fiscal years and for the current year was $45,000, and the items of actual expenditure for those years are stated in the following table. During the period we were at war the volume of commercial wireless work of the Bureau was about the average of prewar years, while the great expansion was mainly under control of the armed forces and only recently is assuming a commercial status. The last column gives the details of the estimates for next year, submitted early in September in view of the increase and change in the nature of work now actually on hand and confronting the Service in the months just ahead.

The statement following shows details of expenditures for this service during the fiscal years 1915, 1916, 1917, 1918, 1919, the proposed distribution for the current fiscal year, and the estimates for 1921:

	1915	1916	1917	1918	1919	1920	1921
Total salaries:							
Field	$27,844.49	$28,379.51	$27,784.66	$24,068.17	$28,602.88	$31,880	$93,638
Bureau	7,150.00	7,150.00	7,013.34	6,369.90	6,698.62	8,050	13,020
Total	34,994.49	35,529.51	34,798.00	30,438.07	35,301.50	39,930	106,658
General expenses:							
Travel	6,245.52	4,355.12	2,317.42	1,262.32	3,668.72	1,500	6,500
Telephone	399.84	401.81	565.88	617.03	695.89	700	1,200
Laundry	....	....	....	....	....	....	....
Furniture	370.26	441.77	151.64	428.27	945.01	450	1,000
Supplies	517.49	331.90	558.76	495.19	234.22	485	1,000
Printing	78.10	116.60	68.79	17.46	135.40	15	200
New instruments	312.79	2,786.75	2,741.09	701.28	430.50	565	5,000
Repairs	1,455.65	109.78	83.05	180.22	348.61	200	500
Telegrams	111.51	33.47	24.33	34.91	27.16	25	100
Freight and cartage	124.84	89.34	63.23	60.59	78.81	65	200
Carfare	218.03	339.15	330.16	246.67	219.26	275	700
Technical books and papers, batteries, wire, and other small materials	168.38	57.00	47.30	95.80	74.05	100	404
Berne publications	....	198.91	13.74	8.73	37.78	15	100
Rent	....	....	98.75	149.25	638.00	675	2,100
New construction and other equipment	....	....	....	10,039.21	1,415.73	....	3,700
Unexpended	3.10	208.89	3,137.86	225.00	749.36	....	....
Total	45,000.00	45,000.00	45,000.00	45,000.00	45,000.00	45,000	129,262

INCREASE IN RADIO COMMUNICATION.

In the meantime the number of American ships equipped with wireless has increased from 585 on June 30, 1915, to 2,312 on June 30, 1919, or fourfold, and is increasing at the rate of about 1,000 a year, owing to the appropriations by Congress to build ships. The number of ship stations licensed is very much in arrears and such ships are operating without compliance with law or international obligation, because the examinations necessary for the license could not be made in view of more pressing work in the inspection of ships for safety about to clear and in the examination of operators for commercial license. About August 1 the Navy Department withdrew about 1,500 naval radio operators from merchant ships, many of which, in consequence, for a brief time could not be adequately and lawfully manned. The inspection force, however, dropped most other work, and up to date 717 operators had been fully licensed and numerous temporary permits issued.

With the ratification of peace and the withdrawal of the Executive war order against radio communication, the commercial land stations will resume business presumably under commercial control, and the amateur transmitting stations and operators will be permitted to enter the restricted fields open to them under the statutes. The number of applications already filed with this Bureau in advance of the restoration of peace conditions points to the prospect of more general radio communication between points on land where wire communication is impracticable than before the war.

The following table shows briefly the growth of radio communication since 1915 and its present status, so far as these admit of concise statistical statement. The number of the inspection force, like the appropriation, was substantially unchanged on June 30. The substance of these statements has already been given to Congress.

June 30—	American ships equipped.	American ships licensed.	Inspections of American and foreign ships.	Commercial operators licensed.	Commercial and experimental land stations.	Amateur stations licensed.	Amateur operators licensed.	Total inspection force.
1915	585	362	6,152	1,653	115	3,547	3,067	26
1916	604	444	7,236	1,278	182	4,942	4,199	28
1917	836	484	7,137	1,682	160	3,741	3,302	28
1918	1,478	392	5,775	1,616				29
1919	2,312	976	5,160	1,645				27

The number and classification of the radio stations of the United States on June 30, 1919 (excluding 3,741 amateur transmitting stations which were closed in April, 1917, and have not yet been permitted to open, the Government stations being mainly those of the Army and Navy), and the grade and number of radio operators under license on June 30, 1919 (excluding amateurs, of whom 4,199 were licensed during the fiscal year 1916, and 3,302 during 1917 up to April, when the issue of such licenses ceased), were as follows:

Radio stations.		Radio operators.	
Classification.	Number.	Grade.	Number.
Commercial land radio stations	47	Commercial extra first	48
Commercial ship radio stations	2,312	Commercial first	2,436
Government land radio stations	269	Commercial second	610
Government ship radio stations	1,580	Emergency first	13
		Emergency second	3
		Cargo	7
Total	4,208		3,117

The officers in charge of the wireless operations of our armies in France commend highly the skill, ingenuity, and versatility of licensed amateur radio operators who volunteered in large numbers for military service and served in dangerous and responsible positions.

SUMMARY OF WORK BY DISTRICTS FOR PAST YEAR.

Following is the usual statement by districts of the work performed during the past fiscal year:

Place of inspection or examination.	Stations inspected.		Operators examined.					Operators licensed.					
			Commercial.					Commercial.			Emergency.		
	Ship—Voluntoor oquipmont.	Ship for license.	Extra first.	First.	Second.	Emergency.	Cargo.	Extra first.	First.	Second.	First.	Second.	Cargo.
First district:													
Boston, Mass.—													
Total 1919	94	12	3	232	18	.....	2	3	147	44	.....	.....	2
Total 1918	127	12	.....	200	25	.....	22	.....	145	12	.....	.....	18
Second district:													
New York, N. Y.—													
Total 1919	141	50	5	619	60	97	11	4	432	54	14	2	10
Total 1918	201	81	9	483	191	.....	43	8	427	124	.....	.....	43
Third district:													
Baltimore, Md	82	35	.....	174	13	52	.....	4	143	19	16	5	.....
Norfolk and Newport News	43	7	.....	49	2	1	.....	.....	39	5	3	.....	.....
Philadelphia	19	7	.....	78	5	37	.....	.....	.....	.....	.....	.....	.....
Total 1919	144	49	.....	301	20	90	.....	4	182	24	19	5	.....
Total 1918	439	10	.....	121	10	.....	8	.....	119	18	.....	.....	7
Fourth district:													
Savannah, Ga.—													
Total 1919	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total 1918	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fifth district:													
New Orleans, La.—													
Total 1919	44	16	2	87	3	4	1	3	86	3	4	1	1
Total 1918	41	10	1	102	6	.....	15	1	62	26	.....	.....	11
Sixth district:													
San Francisco, Calif.—													
Total 1919	91	33	2	259	26	8	7	3	177	33	8	2	15
Total 1918	138	51	3	256	29	.....	20	.....	180	24	.....	.....	14
Seventh district:													
Seattle, Wash.—													
Total 1919	83	26	.....	220	55	15	5	.....	155	29	5	1	5
Total 1918	103	11	.....	161	40	.....	17	.....	104	21	.....	.....	14
Eighth district:													
Detroit, Mich	212	41	.....	179	14	44	.....	.....	59	48	.....	.....	.....
Ashtabula, Ohio	5	3	.....	1	.....	.....	.....	.....	1	.....	.....	.....	.....
Buffalo, N. Y	.....	.....	.....	7	2	12	.....	.....	1	2	.....	.....	.....
Cleveland, Ohio	25	7	.....	10	1	12	.....	.....	6	3	.....	.....	.....
Frankford, Mich	2	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ludington, Mich	3	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total 1919	247	54	.....	197	17	68	.....	.....	67	53	.....	.....	.....
Total 1918	169	15	2	275	154	.....	.....	.....	113	107	.....	.....	.....
Ninth district:													
Chicago, Ill	108	10	2	284	14	32	.....	1	87	67	1	1	.....
Manitowoc, Wis	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total 1919	110	10	2	284	14	32	.....	1	87	67	1	1	.....
Total 1918	197	3	1	354	75	.....	.....	1	173	119	.....	.....	.....
SUMMARY.													
First district	94	12	3	232	18	.....	2	3	147	44	.....	.....	2
Second district	141	50	5	619	60	98	11	4	432	54	14	2	10
Third district	144	49	.....	301	20	90	.....	4	182	24	19	5	.....
Fourth district	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fifth district	44	16	2	87	3	4	1	3	86	3	4	1	1
Sixth district	91	33	2	259	26	10	7	3	177	33	8	2	15
Seventh district	83	26	.....	220	55	15	5	.....	155	29	5	1	5
Eighth district	247	54	.....	197	17	68	.....	.....	67	53	.....	.....	.....
Ninth district	110	10	2	284	14	32	.....	1	87	67	1	1	.....
Grand total 1919	954	250	14	2,199	213	317	26	18	1,333	307	51	12	33
Grand total 1918	1,434	196	16	1,967	531	.....	125	10	1,326	454	.....	.....	107

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RADIO COMMUNICATION.

The change from war conditions to conditions of peace in the regulation of radio communication, involving its transfer from the Navy Department to the Department of Commerce, has been effected in an orderly manner during the year with little or no inconvenience to the various interests concerned. The change from enlisted men as radio operators on merchant ships was effected in July and August, amateur stations were opened and the license of amateur operators resumed soon after, but the transfer of transoceanic radio communication was not effected until late in the fiscal year. The opening of ship to shore communication by commercial stations was held in abeyance until the passage of the act of June 5, 1920, and is being effected gradually, subject to the limitations of that act and the act of August 13, 1912.

The reorganization of the force of radio inspectors has been effected with some difficulty, owing to the small pay available for the force, compared with the pay allowed by the appropriations to corresponding work in other branches of Government and with the more inviting opportunities offered by commercial radiotelegraphic enterprises. The loyalty of the inspectors under the circumstances must be noted, and in no instance have they withdrawn until, even at a sacrifice to themselves, arrangements could be made for the continuation of the work prescribed by Congress.

The following table shows briefly the increase since 1915 of the statutory work which it has been possible for the radio service of the Department of Commerce to perform with the force authorized:

June 30—	American ships equipped.	American ships licensed.	Inspections of American and foreign ships.	Commercial operators licensed.	Commercial and experimental land stations.	Amateur stations licensed.	Amateur operators licensed.	Total inspection force.
1915	585	362	6,152	1,653	115	3,547	3,067	26
1916	604	444	7,236	1,278	182	4,942	4,199	28
1917	836	484	7,137	1,682	160	3,741	3,302	28
1918	1,478	392	5,775	1,616	....	....	....	29
1919	2,312	976	5,160	1,645	....	....	....	27
1920	2,808	1,158	5,419	4,652	157	5,719	5,988	25 45

The deficiency appropriation act of November 4, 1919, authorized an increase in the force from 25 to 45, but owing to the difficulty in securing competent men and delays necessarily incident to civil-service examinations the increased force was, in fact, available for less than half the year. These returns show only imperfectly the work which should have been done and do not fully represent the rapid increase in the use of radiotelegraphy. For example, the number of ships equipped with radio apparatus has increased much more rapidly than it has been possible to make the necessary thorough tests and issue the licenses based thereon, which are required by the International Radiotelegraph Convention and the act to regulate radio communication. There always has been and probably always will be slight arrears in this work, but so many ships during the last two years have been built in the United States that the force of inspectors could not keep up with the work of examination and license without neglecting even more indispensable work, such as examinations and license of operators.

STATION AND OPERATORS' LICENSES.

The following statement shows the number and classification of the radio stations in the United States on June 30, 1920, and the number and grade of licenses issued since 1914 to operators and gives a general impression of the present use of and interest in radio communication in the United States:

Radio stations.		Radio operators.	
Classification.	Number.	Grade.	Number.
Commercial land radio stations	90	Commercial extra first	91
Commercial ship radio stations	2,808	Commercial first and second	13,020
Government land radio stations	262	Experiment and instruction	174
Government ship radio stations	1,312	Cargo	594
Amateur stations licensed	5,719	Amateur first and second	17,843
		Commercial emergency first and second	563
Total	10,191	Total	32,285

As stated elsewhere, licenses have been issued thus far to only 1,158 of the commercial ship stations, and the Government stations, which belong almost wholly to the Army and Navy, are not required to be licensed. The total number of licensed operators is not so large as appears at first blush from the table, as those who hold the higher grade licenses in many cases first took out the lower grade licenses, and as licenses for operators were valid first for a period of one year and then for a period of two years, many renewals are included. The actual number of licensed commercial operators, for example, on June 30, 1920, was approximately 6,500, and the number of licensed amateur operators was 6,100. There are, however, many others heretofore qualified who have allowed their licenses to lapse. The card records of operators will be put in more precise shape if two clerks can be supplied to bring this work and much other work up to date. At present the clerks provided barely suffice to give dispatch to the immediate work of the day.

OPERATORS' LICENSES.

The total number of operators' licenses issued during the past year was 11,179 out of 32,285 issued or renewed during the past seven years. The number of commercial licenses issued was 4,869, or nearly three times as many as during any former year; and the number of amateur operators' licenses was 6,103, owing partly to the fact that while we were at war the issue of amateur licenses was suspended. The number of operators' licenses of the various grades issued each year from 1914 is shown by the following table:

Grade.	1914	1915	1916	1917	1918	1919	1920	Total.
Commercial extra first		18	18	8	13	18	16	91
Commercial first and second	339	1,635	1,260	1,674	1,603	1,640	4,869	13,020
Experiment and instruction	10	27	30	10	(1)	(1)	97	174
Cargo	26	112	173	113	107	33	30	594
Amateur first and second	1,172	3,067	4,199	3,302	(1)	(1)	6,103	17,843
Commercial emergency first and second				217	219	63	64	563
Total	1,547	4,859	5,680	5,324	1,942	1,754	11,179	32,285

[1] Discontinued for the period of the war.

The policy consistently adopted by the Bureau of Navigation has been to encourage the study of radio communication through the issue of licenses to amateurs and the good sense of this policy was shown during the war when it was possible to supply from the amateur class whole companies of radiotelegraphers. But for commercial work, especially on shipboard, high standards of skill have been maintained and during the past year a trifle over 3,000 applicants for commercial licenses have failed to pass this examination, though on second trial after three months' additional study and practice many of these have passed and been licensed.

WORK OF SERVICE, 1919 AND 1920.

The following statement shows the details of the work performed by radio inspectors during the fiscal years ended June 30, 1919, and June 30, 1920, and the increase during the past fiscal year:

	1919	1920	Increase.
Clearances of American and foreign vessels required by law to be equipped with radio	7,688	9,312	1,624
Inspections of radio equipment on American and foreign vessels, required by law to be equipped with radio	5,160	5,419	259
Inspections of radio equipment on voluntarily equipped vessels	954	1,170	216
American ship radio stations licensed	976	1,158	182
American ship radio stations inspected for license	250	794	544
Land radio stations inspected for license	(1)	55	55
Land radio stations licensed (not including amateur stations)	(1)	272	272
Amateur radio stations licensed	(1)	5,719	5,719
Commercial operators examined	2,426	7,958	5,532
Commercial operators licensed	1,658	4,885	3,227
Amateur operators examined	(1)	5,712	5,712
Amateur operators licensed	(1)	6,103	6,103
Defects found upon inspection of ship radio stations, where clearance would have been in violation of the law	425	837	412
American vessels equipped with radio	2,312	2,808	496

Radio inspectors during the past year made 5,419 inspections of apparatus on ships about to depart with 50 or more persons on board. These inspections resulted in the discovery and correction of 837 defects in the apparatus, including 95 cases of inadequate numbers or skill of operators. In 366 cases the means of communication between the bridge of the ship and the radio operating room was insufficient or wholly lacking and in 310 cases the auxiliary apparatus or source of supply was inadequate or lacking. As the value and use of the wireless installation usually depends in case of serious accident upon either direct communication between the officer on the bridge and the radio operator or upon the availability of the auxiliary apparatus, designed for use in emergency, the inspections, it will be seen, serve a useful purpose.

COST OF RADIO SERVICE.

The total annual appropriation for the radio service for some years was $45,000, including $7,150 for the work at Washington, and that amount was originally provided for the fiscal year just ended. A deficiency increase of $20,000 was made available by the deficiency act of November 4, 1920, but has not sufficed and as shown elsewhere the statutory work is in arrears. The amount appropriated for the current fiscal year was only $60,000 and it will be necessary again to apply for a deficiency appropriation. The tabulation following shows the amounts expended under various heads for the radio service for the past five fiscal years, the allotment proposed of the appropriation for the current fiscal year, and the estimates for the fiscal year which will end June 30, 1922.

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[1] Discontinued during the war and authorized to begin operations October, 1919.

	1916	1917	1918	1919	1920	1921	1922
Total salaries:							
Field	$28,379.51	$27,784.66	$24,068.17	$28,602.88	$46,869.97	$43,190.00	$88,610.00
Bureau	7,150.00	7,013.34	6,369.90	6,698.62	8,050.00	8,400.00	12,600.00
Total	35,529.51	34,798.00	30,438.07	35,301.50	54,919.97	51,590.00	101,210.00
General expenses:							
Travel	4,355.12	2,317.42	1,262.32	3,668.72	2,810.67	3,700.00	4,000.00
Telephone	401.81	565.88	617.03	695.89	848.74	850.00	1,000.00
Furniture	441.77	151.64	428.27	945.01	198.71	250.00	1,000.00
Supplies	331.90	558.76	495.19	234.22	861.89	650.00	1,000.00
Printing	116.60	68.79	17.46	135.40	117.17	100.00	200.00
New instruments	2,786.75	2,741.09	701.28	430.50	3,365.52	1,000.00	5,000.00
Repairs	109.78	83.05	180.22	348.61	54.90	250.00	500.00
Telegrams	33.47	24.33	34.91	27.16	78.02	90.00	100.00
Freight and cartage	89.34	63.23	60.59	78.81	128.75	200.00	200.00
Carfare	339.15	330.16	246.67	219.26	324.16	350.00	700.00
Technical books and papers, batteries, wire, and other small materials	57.00	47.30	95.80	74.05	140.07	50.00	400.00
Berne publications	198.91	13.74	8.73	37.78	12.00	50.00	100.00
Rent		98.75	149.25	638.00	795.00	850.00	2,000.00
New construction and other equipment			10,039.21	1,415.73			
Unexpended	208.89	3,137.86	225.00	749.36	344.43	20.00	20.00
Total	45,000.00	45,000.00	45,000.00	45,000.00	65,000.00	60,000.00	117,430.00

The Bureau of Navigation is not engaged in "making work," or in "growing in importance," or in devising plans of probable or speculative value, or in undertaking work which always has been and still is the proper field for private enterprise. Its efforts are to give effect, in as direct and economical a manner as possible, to the plain requirements of acts of Congress. When the scope of application of those acts is greatly extended by Congress itself, as through the expenditure of vast sums for building ships, the volume of work of the radio service prescribed by law increases correspondingly. With the increased use of radio apparatus for land communication, a further increase in the volume of the work has ensued, and in all forms of radio communication, improvements in apparatus and methods call for higher standards of attainment in the inspection force and pay that shall in some degree correspond with those attainments. The estimates for the year ending June 30, 1922, are almost double the appropriations for the last and the current fiscal year which were quite inadequate to the performance of the work prescribed by law.

INTERNATIONAL RADIOTELEGRAPH CONVENTION.

The International Radiotelegraph Convention was framed in 1912 and the act of August 13, 1912, was enacted to give effect to that convention upon radio communication so far as within the jurisdiction of the United States. In 1912 transoceanic radio communication was in the experimental stage and properly the convention of that year referred to the subject only in general terms. Such communication is now a form of daily commercial intercourse across the Atlantic and Pacific. Again, new inventions and improvements in methods of communication have permitted of sharper tuning and have reduced interference so that the wave-length requirements both of the convention and of the act of 1912 should be revised. The conference of 1912 foresaw the probability of rapid development in the art and provided for a new conference in 1917 which, of course, was prevented by the war. The International Telegraph Convention (which covers also certain phases of cable and telephonic communication) was put in its present shape at Lisbon in 1908. The Government of the United States has never adhered to this convention, but the principal nations signatory to it are agreed that it also needs revision in the light of the development in the art and processes of wire communications by telegraph, telephone, and cable. Communication by wire and by wireless, of course, are closely related, and the desirability of revising the two conventions at the same time and place is obvious. The Government of the United States called a preliminary communications conference of representatives of France, Great Britain, Italy, Japan, and the United States for October, 1920, and this will be followed by a general conference to be held some time in 1921.

The revision of the International Radiotelegraph Convention has been carefully considered by a committee appointed by the Secretary of Commerce of men whose competency to deal with the subject is recognized, comprising representatives of the scientific organizations, operating and manufacturing companies, and amateurs, as well as of the several departments of Government interested in radio communication. This committee unanimously agreed upon the changes which are desirable in the convention of 1912, and in time they are likely in substance to be incorporated in the new international convention. The act of August 13, 1912, to regulate radio communication should be amended to conform to the revised international convention, and probably in the long run time will be saved and more practical results will be secured if the revised convention and the revised act can be considered by Congress at about the same time.

RADIO ADMINISTRATION.

The branches of the Government directly concerned with radio communication afloat or ashore are:

1. The Department of Commerce, which is charged with the administration of the acts of Congress relating to commercial radio communication and the administrative provisions of the International Radiotelegraph Convention (acts of June 24, 1910; July 23, 1912; Aug. 13, 1912, and the legislative appropriation act from year to year).
2. The Treasury Department, in so far as apparatus and operators are employed on Coast Guard cutters which are not required to be licensed.
3. The War Department, in so far as apparatus and operators are employed in the Signal Service, the Air Service, the Army Transport Service, and to an extent in coast defense. Operators and apparatus are not licensed.
4. The Post Office Department, in so far as apparatus and operators are beginning to be employed on mail airplanes. Apparatus and operators are not licensed.

5. The Navy Department, in so far as apparatus and operators are employed on war ships and at coast stations designed for communication with the fleet but in part employed during the war for commercial purposes; also on seaplanes. Operators and apparatus are not licensed.

6. The Department of Agriculture, in so far as it supplies meteorological information for distribution by radio communication.

In addition, the United States Shipping Board, as the largest owner of American ships employed in trade, has the shipowners' interest in the apparatus and operators required by law to be licensed and employed on its ships.

The dividing line in principle between the relations of these departments to radio communication is quite plain; the Department of Commerce is the instrumentality selected by Congress in 1910 for the enforcement of its laws for the regulation of radio communication based on the commerce clause of the Constitution, the other departments employ apparatus and operators as an incident to the lines of public duty intrusted to them, respectively, and the Shipping Board stands on the same plane as the merchant shipowner, subject to like commercial regulation. This situation existed in 1910 and 1912 when the first acts relating to wireless telegraphy were passed, and the distinction is fundamental and will continue unless the policy of the United States is changed and radio communication is made a Government monopoly. To secure harmonious relations between the administration of laws for the regulation of commercial radiotelegraphy, which in times of peace is of the first and most general interest to the country, and the use of radio communication for their own limited and special purposes by the several branches of Government just named, the Department of Commerce, with the cooperation of the heads of the departments named, established informally at the outset an advisory committee by which matters of concern could be talked over and, if practical, agreed upon. This informal committee was in reasonably successful operation up to the entry of the United States into the war, when all forms of radio communication were either stopped or put under control of the armed forces, mainly the Navy.

With the return to the conditions of peace the matter of the administration of the laws relating to radio communication has attracted some notice. During the war it became the custom, doubtless for valid reasons, to create commissions, boards, or committees to accomplish many purposes and to vote to them large lump sums, in some instances vast sums, to carry out those purposes. The question of the adaptability of commissions or boards to administrative duties in ordinary times need not be considered in view of our large recent experience with them in war times. Their value for advisory purposes is quite plain and, as stated, an advisory committee was employed from the first in radiotelegraphy. A statutory radio board or commission, composed of representatives of the departments named and possibly of other interests, will require a full staff and field force of its own, an entire organization. The imposition of its orders on a department is, on the face of things, undesirable, for the department will realize its limitations, created in part by the funds at its disposal, while the commission or board will be free from the responsibility for adjusting limited means to ends in the issue of orders, and will content itself with instructions and place upon the department all responsibility. In a word, such a commission would from its nature lead to divided responsibility, the gravest error in administration. The actual administrative need of radio communication at the present time is not a multiplied and divided headquarters staff, with the inevitable increase in overhead expenses, but a field force equal to the performance of the daily diversified work of actual inspection, which increases with the increase in ships and the increase in land stations. It is quite possible that in time the enforcement of the laws governing radio communication may justify or require the creation of a separate office or bureau in the Department of Commerce for that purpose, but at a time when rigid economy should be imposed in all branches of administration such a project may wait until enough men have been provided to do the daily work at seaports and elsewhere which is already prescribed by law.

SUMMARY OF WORK BY DISTRICTS.

Following is the usual statement by districts of the work done by the radio service during the past fiscal year

Place of inspection or examination.	Stations inspected.					Amateur stations licensed.	Operators examined.						Experiment and instruction.	Emergency.	Operators licensed.							
							Commercial.			Amateur.					Commercial.			Amateur.				
	Ship—Voluntary equipment.	Ship for license.	Land.[1]	Land for license.[1]	General and restricted amateur.		Extra, first.	First.	Second.	First.	Second.	Cargo.			Extra, first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.	Emergency.
First district:																						
Boston, Mass.	150	104	7	10	4	1,268	2	639	95	866	431	1	......	42	1	403	100	852	431	1	......	54
Providence, R. I.	2	1	1	1	1	......	......	15	......	12	......	......	......	1	......	10	......	10	......	......	......	1
Portland, Me.	1	1	......	......	1	......	......	4	......	12	......	......	......	......	......	1	3	12	......	......	......	......
New London, Conn.	......	......	1	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
New Haven, Conn.	......	......	1	1	......	......	......	1	1	30	......	......	......	......	......	......	2	24	......	......	......	......
Bridgeport, Conn.	......	......	......	......	......	......	......	......	......	14	......	......	......	......	......	......	......	10	......	......	......	......
Hartford, Conn.	......	......	......	......	2	......	......	......	......	19	......	......	......	......	......	......	......	18	......	......	......	......
Springfield, Mass.	......	......	......	......	1	......	......	1	......	11	......	......	......	......	......	......	......	10	......	......	......	......
Worcester, Mass.	......	......	1	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Fall River, Mass.	1	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Total, 1920	154	107	11	14	9	1,268	2	660	96	904	431	1	......	43	1	414	105	936	431	1	......	55
Total, 1919	94	12	......	......	......	......	3	232	18	......	......	2	......	......	3	147	44	......	......	2	......	......
Second district:																						
New York, N. Y.	23	100	4	11	34	1,117	7	1,349	652	195	......	2	......	......	......	942	567	268	788	2	4	5
Albany, N. Y.	......	......	......	......	1	......	......	......	......	30	......	......	......	......	......	......	......	......	......	......	......	......
Slingerlands, N. Y.	......	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Troy, N. Y.	......	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Schenectady, N. Y.	......	......	......	......	7	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Babylon, N. Y.	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
New Brunswick, N. J.	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Total, 1920	23	100	4	13	44	1,117	7	1,349	652	231	......	2	......	......	......	942	567	268	788	2	4	5
Total, 1919	141	50	......	......	......	......	5	619	60	97	1	11	......	......	4	432	54	......	......	10	......	16

Third district:																						
Baltimore, Md.	260	216	2	4	214	627	4	1,407	147	459	78	......	1	......	2	694	174	488	130	1	1	......
Norfolk and Newport News	118	44	2	2	12	......	2	201	43	5	3	1	......	......	2	97	38	8	5	1	7	......
Philadelphia, Pa.	39	39	......	......	......	......	......	601	8	346	......	......	......	......	......	1	......	......	......	......	......	......
Richmond, Va.	......	......	......	......	......	......	......	......	......	2	......	......	......	......	......	......	......	......	......	......	......	......
Wilmington, Del.	3	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Total, 1920	420	300	4	6	226	627	6	2,209	198	812	81	1	1	......	4	792	212	496	135	2	8	......
Total, 1919	144	49	......	......	......	1	......	301	20	90	......	1	......	......	4	182	24	......	......	......	......	24
Fourth district: [2]																						
Savannah, Ga.	1	2	......	2	3	83	......	32	9	7	49	......	2	......	......	21	5	38	60	......	......	......
Wilmington, N. C.	......	......	......	......	......	......	......	......	......	3	......	......	......	......	......	......	......	......	......	......	......	......
Raleigh, N. C.	......	......	......	......	......	......	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......
Charleston, S. C.	......	......	......	......	......	......	......	4	1	......	......	......	......	......	......	3	3	......	......	......	......	......
Atlanta, Ga.	......	......	......	......	9	1	......	10	7	13	......	......	......	......	......	2	......	11	1	......	......	......
Tampa, Fla.	......	......	......	......	1	......	......	......	......	5	......	......	......	......	......	......	......	......	......	......	......	......
Pensacola, Fla.	......	......	......	......	......	......	......	1	......	......	......	......	......	......	......	4	4	8	......	......	......	......
Jacksonville, Fla.	......	1	......	......	......	7	......	15	3	8	2	......	......	......	......	3	......	......	3	......	......	......
Miami, Fla.	......	......	......	......	......	......	......	6	......	5	......	......	......	......	......	......	......	......	......	......	......	......
Key West, Fla.	......	1	......	......	......	......	......	6	......	......	......	......	......	......	......	1	......	......	......	......	......	......
Total, 1920	1	4	......	2	13	91	......	74	20	42	51	......	2	......	......	34	12	57	64	......	......	......
Total, 1919	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Fifth district:																						
New Orleans, La.	57	62	1	1	20	194	......	366	79	22	186	3	......	......	2	195	76	32	188	3	66	......
Burwood, La.	......	......	1	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Houston, Tex.	......	......	......	......	8	7	......	5	11	25	4	......	......	......	......	4	4	10	7	......	......	......
Galveston, Tex.	3	2	......	......	......	1	......	10	13	2	3	......	......	......	......	6	5	1	1	......	......	......
Dallas, Tex.	......	......	......	......	......	1	......	2	2	29	3	......	......	......	......	......	2	5	......	......	......	......
Mobile, Ala.	9	7	......	......	......	......	......	[3] 2	[3] 1	......	......	......	......	......	......	2	......	......	......	......	......	......
Birmingham, Ala.	......	......	......	......	......	[3] 1	......	[3] 3	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Total, 1920	69	71	2	2	28	204	......	388	106	78	196	3	......	......	2	207	87	48	196	3	66	......
Total, 1919	44	16	......	......	......	......	2	87	3	4	......	1	......	......	3	86	3	......	......	1	......	5
Sixth district:																						
San Francisco, Calif.	166	93	3	......	50	502	2	630	48	377	190	6	3	......	3	459	72	360	197	6	3	......
Los Angeles, Calif.	......	......	......	......	2	......	......	38	5	18	......	......	......	......	......	1	......	18	......	......	......	......
San Diego, Calif.	......	......	......	......	......	......	......	2	......	1	......	......	......	......	......	......	......	1	......	......	......	......
San Jose, Calif.	......	......	......	......	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Honolulu, Hawaii	......	......	......	......	......	......	......	5	......	......	......	......	......	......	......	11	......	......	......	......	......	......
Total, 1920	166	93	3	......	53	502	2	675	53	396	190	6	3	......	3	471	72	379	197	6	3	......
Total, 1919	91	33	......	......	......	......	2	259	26	8	2	7	......	......	3	177	33	......	......	15	......	10

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[1] Coast, inland, and special land stations.

[2] All work in the fourth district was performed by the radio inspector of the third district.

[3] Work performed by radio inspector of the third district.

Place of inspection or examination.	Stations inspected.					Amateur stations licensed.	Operators examined.								Operators licensed.							
							Commercial.			Amateur.					Commercial.			Amateur.				
	Ship—Voluntary equipment.	Ship for license.	Land.[1]	Land for license.[1]	General and restricted amateur.		Extra, first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.	Emergency.	Extra, first.	First.	Second.	First	Second.	Cargo.	Experiment and instruction.	Emergency.
Seventh District:																						
Seattle, Wash.	172	72	13	10	56	211	6	300	111	83	130	4	1		4	200	149	74	140	4	3	4
Portland, Oreg.		4			3			43	20	26												
Total, 1920.	172	76	13	10	59	211	6	433	131	109	130	4	1		4	260	149	74	140	4	3	4
Total, 1919.	83	26						220	55	15		5				155	29			5		6
Eighth District:																						
Detroit, Mich.	136	31	4	4		707	1	200	7	173	621				1	113	23	147	621	12	1	
Cleveland, Ohio.	11	9	4	4	1	69		80	2	135	1		1			35	16	104	1		1	
Ashtabula, Ohio.	2	2				15																
Toledo, Ohio.								15		16						1	2	15				
Pittsburgh, Pa.						18		23	7	85						5	17	76				
Buffalo, N. Y.						18		11	9	19						2	3	19				
Total, 1920.	149	42	8	8	1	827	1	329	25	428	622		1		1	156	61	361	622	12	2	
Total, 1919.	247	54						197	17	68						67	53					
Ninth District:																						
Chicago, Ill.	16	1				870	2	457	6	217	641		11		1	211	75	196	641		11	
Duluth, Minn.								5		16						1	3	11				
Minneapolis, Minn.								29		25						7	13	19				
St. Louis, Mo.								15		9						2	5	13				
Kansas City, Mo.						2		7		13	1					3	2	15	1			
Milwaukee, Wis.								11		11						2	2	7				
Indianapolis, Ind.								4		9						1	1	8				
Total, 1920.	16	1				872	2	528	6	300	642		11		1	227	101	269	642		11	
Total, 1919.	110	10					2	284	14	32					1	87	67					2

SUMMARY.																						
First district	154	107	11	14	9	1,268	2	660	96	964	431	1	......	43	1	414	105	936	431	1	......	55
Second district	23	100	4	13	44	1,117	7	1,349	652	231	......	2	......	......	......	942	567	268	788	2	4	5
Third district	420	300	4	6	226	627	6	2,209	198	812	81	1	1	......	4	792	212	496	135	2	8	......
Fourth district	1	4	......	2	13	91	......	74	20	42	51	......	2	......	......	34	12	57	64	......	......	......
Fifth district	69	71	2	2	28	204	......	388	106	78	196	3	......	......	2	207	87	48	196	3	66	......
Sixth district	166	93	3	......	53	502	2	675	53	396	190	6	3	......	3	471	72	379	197	6	3	......
Seventh district	172	76	13	10	59	211	6	433	131	109	139	4	1	......	4	260	149	74	140	4	3	4
Eighth district	149	42	8	8	1	827	1	329	25	428	622	......	1	......	1	156	61	361	622	12	2	......
Ninth district	16	1	......	......	......	872	2	528	6	300	612	......	11	......	1	227	101	269	642	......	11	......
Grand total, 1920	1,170	794	45	55	433	5,719	26	6,645	1,287	3,360	2,352	17	19	43	16	3,503	1,366	2,888	3,215	30	97	64
Grand total, 1919	954	250	......	....	......	......	14	2,199	213	314	3	26	......	......	18	1,333	307	......	......	33	......	63

SELECTIONS FROM
ANNUAL REPORT OF THE COMMISSIONER OF NAVIGATION TO THE SECRETARY OF COMMERCE

1921-1926

Selection from

ANNUAL REPORT

OF THE

COMMISSIONER OF NAVIGATION

TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1921

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

WASHINGTON
GOVERNMENT PRINTING OFFICE
1921

RADIO COMMUNICATION.

The following pages contain the usual review of different phases of work of the radio service of the Bureau during the past year. Throughout the year, however, the one fact made plain in nearly every field of wireless activity has been the need of an early readjustment of the relations and agencies of the Government with radio communication and of the statutory regulation of the art. This is one of the results of the war which gave an impetus to the art that has carried it within seven years much further than in all its previous history. The same situation obtains abroad as at home, and a new international convention upon the subject is urgently needed. Preliminary steps toward such an agreement were taken at the meeting in Washington last autumn and at the meeting of the international technical radiotelegraphic committee in Paris this summer.

The first practical question to be considered is whether international regulation of all forms of electrical communication shall be embodied in one international convention covering telegraphs, telephones, and cables as well as wireless. The relations of these forms of communication with one another are, of course, becoming closer and the separate treatment of each more difficult; indeed, under the European system where the telegraphs and telephones are almost wholly owned and operated by governments as parts of their respective postal systems, radio communication naturally takes its place with them, and one administration and one general scheme of regulation is natural and proper. The short-lived experiment with Government operation of telegraphs in the United States, under the trying conditions of war, was not so successful as to recommend to public favor the permanent adoption of that system. Anyone who has had experience with the Government owned and operated telephone systems of Europe is unlikely to prefer on any grounds that system to the superior service maintained by private capital in the United States.

The need for revision of the international radiotelegraph convention stands quite apart, however, from the proposed adherence of the United States to international regulation of its telegraph and telephone systems. Radio communication, even for the United States, is essentially international, and the basic rules must command international assent in the same way as the rules to prevent collisions at sea. The international convention of 1912 relates almost wholly to communication between ship and shore stations and between one ship and others, and the wave-length prescriptions are honored more in the breach than in the observance by ships which nowadays are in touch with the land throughout a trans-Atlantic voyage. The only international regulation provided for radio communication between high-powered stations transmitting across the oceans and for radio communication between points on the land is the direction in article 8.

> The working of the radio stations shall be organized as far as possible in such manner as not to disturb the service of the radio stations.

Yet the great development of radio communication recently has been in high-powered trans-Atlantic communication where the number of wave lengths available in the present stage of the art is limited, and, so far as the United States is concerned, in the rapid development also of communication between points on land, supplementing the telegraph and telephone, and in the matter of broadcasting messages performing a service which the telegraph and telephone render only tardily or inadequately.

INCREASE OF WORK AND FIELD FORCE.

The act of June 24, 1910, provided that after July 1, 1911, ocean-going steamers carrying 50 or more persons should be equipped with wireless apparatus capable of transmitting messages at least 100 miles in charge of an operator skilled in its use. Congress appropriated $7,000 to carry out the act during the year ended June 30, 1912, which barely sufficed to pay salaries to three competent inspectors, purchase the necessary instruments, and pay travel expenses. Under the act 206 American ships were equipped with wireless that year, and American and foreign ships were inspected at 2,207 clearances. The

American act of 1910 was followed shortly by similar legislation by other countries. The act of July 23, 1912, provided for a continuous wireless watch on shipboard, and this principle was incorporated in the international convention of 1914 on safety of life at sea. The act of August 13, 1912, to regulate radio communication and the ratification by the Senate of the international radiotelegraphic convention followed, and for the year 1913 the appropriation was increased to $37,880. The following table presents an outline of the increase in the use of wireless apparatus and the consequent increase in the work of the service. The first column shows the number of American ships equipped with wireless rising from 555 on June 30, 1914, to nearly 3,000 on June 30, 1921. The remaining columns show the licenses issued to stations and operators and the number of ships inspected during each year given.

June 30—	American ships equipped.	American ships licensed.	Inspections of American and foreign ships.	Commercial operators licensed.	Commercial and special land stations.	Amateur stations licensed.	Amateur operators licensed.	Total field force.
1914	555	203	6,484	339	83	2,137	1,172	20
1915	585	362	6,152	1,653	115	3,547	3,067	26
1916	604	444	7,236	1,278	182	4,942	4,199	28
1917	836	484	7,137	1,682	160	3,741	3,302	28
1918	1,478	392	5,775	1,616	....	....	....	29
1919	2,312	976	5,160	1,645	....	....	....	27
1920	2,808	1,158	5,419	4,652	254	5,719	5,988	25–45
1921	2,978	921	5,591	2,722	491	7,351	6,207	26

The last column shows the number of the field force. The work had increased so rapidly and had fallen so far in arrears that for the year 1920 Congress voted a deficiency appropriation of $20,000 which permitted the temporary employment of 20 additional inspectors for about six months of that year.

STATION AND OPERATORS' LICENSES.

The following statement shows the number and classification of the radio stations in the United States on June 30, 1920 and 1921, and the number and rating of licenses issued to operators from 1914 to June 30, 1921, and gives a general impression of the extent of the use of radio apparatus for the transmission of messages and of the number of qualified operators:

Classification.	Number.		Grade.	Number, 1914–1921, inclusive.
	1920	1921		
RADIO STATIONS.			RADIO OPERATORS.	
Commercial land radio	90	161	Commercial extra first	107
Commercial ship radio	2,808	2,978	Commercial first and second	15,726
Government land radio	262	227	Experiment and instruction	207
Government ship radio	1,312	1,158	Cargo	630
Amateur stations licensed	5,719	13,070	Amateur first and second	24,050
Special land radio	....	418	Commercial emergency first and second	563
Total	....	18,012	Total	41,283

COST OF RADIO SERVICE.

The following statement shows the expenditures in detail for the radio service during each of the past five years, the appropriations for the current year and the proposed allotments, and the estimates for the year ending June 30, 1923:

	1917	1918	1919	1920	1921	1922	1923
Total salaries:							
Field	$27,784.66	$24,068.17	$28,602.88	$46,869.97	$43,795.51	$60,430.00	$60,430.00
Bureau	7,013.34	6,369.90	6,698.62	8,050.00	8,335.96	10,900.00	11,700.00
Total	34,798.00	30,438.07	35,301.50	54,919.97	52,131.47	71,330.00	72,130.00
General expenses:							
Travel	2,317.42	1,262.32	3,668.72	2,810.67	3,583.14	3,510.00	3,510.00
Telephone	565.88	617.03	695.89	848.74	822.20	941.00	941.00
Furniture	151.64	428.27	945.01	198.71	818.28	250.00	250.00
Supplies	558.76	495.19	234.22	861.89	479.26	650.00	650.00
Printing	68.79	17.46	135.40	117.17	110.74	125.00	125.00
New instruments	2,741.09	701.28	430.50	3,365.52	46.34	1,000.00	1,000.00
Repairs	83.05	180.22	348.61	54.90	192.22	250.00	250.00
Telegrams	24.33	34.91	27.16	78.02	....	40.00	40.00
Freight and cartage	63.23	60.59	78.81	128.75	163.85	200.00	200.00
Carfare	330.16	246.67	219.26	324.16	323.50	480.00	480.00
Technical books and papers, batteries, wire, and other small materials	47.30	95.80	74.05	140.07	87.23	85.00	85.00
Berne publications	13.74	8.73	37.78	12.00	46.73	50.00	50.00
Rent	98.75	149.25	638.00	795.00	1,144.50	1,080.00	1,080.00
New construction and other equipment	....	10,039.21	1,415.73	....	22.65	9.00	9.00
Unexpended	3,137.86	225.00	749.36	344.43	27.89	....	....
Total	45,000.00	45,000.00	45,000.00	65,000.00	60,060.00	80,000.00	80,800.00

OPERATORS' LICENSES.

The total number of operators' licenses issued the past year was 8,998 out of a total of 39,756 issued or renewed during the past seven years.

As a new system of operators' ratings took effect on July 1, 1921, the following statement of operators' licenses issued during the past seven years is presented for the permanent record:

Grade.	1915	1916	1917	1918	1919	1920	1921	Total.
Commercial extra first	18	18	8	13	18	16	16	107
Commercial first and second	1,635	1,260	1,674	1,603	1,640	4,869	2,706	15,387
Experiment and instruction	27	30	10	(1)	(1)	97	33	197
Cargo	112	173	113	107	33	30	36	604
Amateur first and second	3,067	4,199	3,302	(1)	(1)	6,103	6,207	22,878
Commercial emergency first and second	....	....	217	219	63	64	0	563
Total	4,859	5,680	5,324	1,942	1,754	11,179	8,998	39,736

[1] Discontinued for the period of the war.

The new system preserves, of course, the classes of operators, according to their skill and knowledge of radio apparatus and its regulation, as established by the international radiotelegraphic convention of 1912. This skill and knowledge is determined by examination, partly in writing and partly by actual tests in transmitting and receiving messages. The National United Radio Telegraphers' Association pointed out last spring that these tests can not well be made under actual service conditions nor can any examination give full credit for experience acquired by radiotelegraphers in the varying circumstances and emergencies which test the operator's intelligence and resourcefulness at sea. The form of license in use had provided for a record of such services, which will be retained, but hereafter the licenses will be issued in three grades according to the length of service of the operator.

DETAILED WORK OF THE RADIO SERVICE.

The following statement shows the details of the work performed by radio inspectors during the past fiscal year compared with the previous year:

Work of service.	1920	1921
Clearances of American and foreign vessels required by law to be equipped with radio	9,312	9,581
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	5,419	5,591
Inspections of radio equipment on voluntarily equipped vessels	1,170	514
American ship radio stations licensed	1,158	921
American ship radio stations inspected for license	794	463
Land radio stations inspected for license	55	96
Land radio stations (not including amateur stations)	254	491
Amateur radio stations licensed	5,719	7,351
Commercial operators examined	7,958	4,308
Commercial operators licensed	4,885	2,722
Amateur operators examined	5,712	5,759
Amateur operators licensed	6,103	6,207
Defects found upon inspection of ship radio stations where clearance would have been in violation of the law	837	553
American vessels equipped with radio	2,808	2,978

SUMMARY OF WORK BY DISTRICTS.

Following is the usual statement, by districts, of the work done by the radio service during the past fiscal year:

Place of inspection or examination.	Stations inspected.					Amateur stations licensed.	Operators examined.						Experiment and instruction.	Operators licensed.						
							Commercial.			Amateur.				Commercial.			Amateur.			
	Ship—Voluntary equipment.	Ship for license.	Land.[1]	Land for license.[1]	General and restricted amateur.		Extra, first.	First.	Second.	First.	Second.	Cargo.		Extra, first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.
First district:																				
Boston, Mass.	67	62	9	8	2	756	7	450	21	319	443	2	1	5	228	83	316	443	2	1
Belfast, Me.	.....	.....	.....	1	.....	3	.....	8	.....	2	.....	.....	.....	.....	4	.....	2	.....	.....	.....
Newport, R. I.	.....	.....	.....	1	.....	2	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	.....	.....
Pawtucket, R. I.	.....	.....	.....	.....	4	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	4	.....	.....	.....
Providence, R. I.	1	1	.....	.....	.....	.....	.....	56	.....	7	.....	.....	.....	.....	12	7	7	.....	.....	.....
Rockland, Me.	.....	.....	2	1	1	3	.....	.....	.....	1	2	.....	.....	.....	.....	.....	1	2	.....	.....
Siasconset, Mass.	.....	.....	.....	1	.....	25	.....	.....	.....	2	4	.....	1	.....	.....	.....	2	4	.....	1
Springfield, Mass.	.....	.....	.....	.....	2	.....	.....	.....	.....	20	.....	.....	.....	.....	.....	.....	13	.....	.....	.....
Total, 1921	68	63	11	12	9	789	7	514	21	356	449	2	2	5	244	90	346	449	2	2
Total, 1920	154	107	11	14	9	1,268	2	660	96	964	431	1	43	1	414	105	936	431	1	55
Second district:																				
New York, N. Y.	97	101	31	18	2	794	3	383	525	450	.....	21	.....	1	575	224	395	387	15	.....
Total, 1921	97	101	31	18	2	794	3	383	525	450	.....	21	.....	1	575	224	395	387	15	.....
Total, 1920	23	100	4	13	44	1,117	7	1,349	652	231	.....	2	.....	.....	942	567	288	788	2	4
Third district:																				
Baltimore, Md.	36	49	4	4	29	1,427	.....	520	74	121	.....	.....	1	2	341	123	470	460	.....	1
Norfolk and Newport News	28	27	.....	.....	2	.....	1	81	22	14	.....	1	.....	1	54	11	11	.....	1	.....
Philadelphia, Pa.	1	2	2	.....	5	.....	.....	396	14	362	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cape May, N. J.	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total, 1921	65	78	7	5	36	1,427	1	997	110	497	.....	1	1	3	395	137	481	460	1	1
Total, 1920	417	299	4	6	226	627	6	2,209	198	810	81	1	1	4	792	212	496	135	2	8
Fourth district:																				
Savannah, Ga.	.....	.....	.....	.....	.....	184	.....	9	8	11	.....	.....	.....	.....	1	1	3	117	.....	.....
Total, 1921	.....	.....	.....	.....	.....	184	.....	9	8	11	.....	.....	.....	.....	1	1	3	117	.....	.....
Total, 1920	1	4	.....	2	13	92	.....	79	21	44	51	.....	2	.....	34	12	57	64	.....	.....

Fifth district:																				
New Orleans, La	38	39	......	......	2	253	......	216	153	21	219	1	......	3	166	51	61	219	1	10
Dallas, Tex	......	......	2	1	14	......	......	7	2	38	......	......	1	......	......	2	......	......	......	......
Fort Worth, Tex	......	......	1	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Galveston, Tex	3	......	......	......	......	......	......	2	......	......	......	......	......	......	1	......	......	......	......	......
Houston, Tex	......	......	3	......	10	......	......	7	......	21	......	......	......	......	2	......	......	......	......	......
Total, 1921	41	39	6	2	26	253	......	232	155	80	219	1	1	3	169	53	61	219	1	10
Total, 1920	73	71	2	2	28	203	......	383	105	78	190	3	......	2	207	88	48	196	3	66
Sixth district:																				
San Francisco, Calif	95	88	16	12	6	629	4	399	36	354	201	16	4	3	278	56	297	221	15	4
Fresno, Calif	......	......	......	......	1	......	......	......	......	2	......	......	......	......	......	......	......	......	......	......
Long Beach, Calif	......	......	2	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Los Angeles, Calif	1	1	......	......	2	......	......	34	......	73	11	......	......	......	4	......	4	9	......	......
Riverside, Calif	......	......	......	......	......	......	......	3	......	......	......	......	......	......	......	......	......	......	......	......
San Diego, Calif	1	......	1	......	......	......	......	4	......	9	......	......	......	......	......	......	......	......	......	......
Total, 1921	97	89	19	12	9	629	4	440	36	438	212	16	4	3	282	56	301	230	15	4
Total, 1920	166	93	3	......	53	502	2	675	53	396	190	6	3	3	471	72	379	197	6	3
Seventh district:																				
Seattle, Wash	48	52	15	11	7	303	2	243	96	135	245	2	......	1	155	52	114	218	2	......
Total, 1921	48	52	15	11	7	303	2	243	96	135	245	2	......	1	155	52	114	218	2	......
Total, 1920	172	76	13	10	59	211	6	433	131	109	139	4	1	4	260	149	74	140	4	3
Eighth district:																				
Detroit, Mich	74	21	26	19	1	1,336	1	133	7	18	581	......	8	......	68	25	44	680	......	8
Buffalo, N. Y	......	......	......	......	2	......	......	8	......	75	......	......	......	......	......	2	63	......	......	......
Cincinnati, Ohio	......	......	2	2	2	......	......	6	......	62	......	......	......	......	1	......	45	......	......	......
Cleveland, Ohio	8	5	9	6	2	4	......	26	......	193	2	......	......	......	3	7	99	2	......	......
Dayton, Ohio	......	......	1	1	......	30	......	1	7	46	......	......	......	......	......	......	35	......	......	......
Frankfort, Mich	2	2	......	......	......	35	......	......	......	......	......	......	......	......	1	......	......	......	......	......
Ludington, Mich	4	4	......	......	......	......	......	......	......	......	1	......	1	......	......	......	......	1	......	1
Pittsburgh, Pa	......	......	2	2	......	33	......	12	......	61	......	......	......	......	......	......	36	6	......	......
Rochester, N. Y	......	......	......	......	......	......	......	3	7	60	......	......	......	......	......	3	56	......	......	......
Total, 1921	88	32	40	30	7	1,438	1	189	21	515	584	......	9	......	73	37	378	689	......	9
Total, 1920	149	42	8	8	......	827	1	329	25	428	622	......	1	1	156	61	361	622	12	2
Ninth district:																				
Chicago, Ill	9	8	2	3	1	1,496	......	211	20	246	1,048	......	6	......	97	65	309	1,048	......	7
Davenport, Iowa	......	......	2	......	......	3	......	7	2	36	2	......	......	......	......	......	......	2	......	......
Denver, Colo	......	......	3	1	1	......	......	2	3	53	......	......	......	......	......	......	......	......	......	......
Indianapolis, Ind	......	......	1	......	......	......	......	8	......	12	......	......	......	......	......	......	......	......	......	......
Kansas, City, Mo	......	......	......	1	......	......	......	6	3	39	......	......	......	......	......	......	......	......	......	......
Manitowoc, Wis	1	1	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......
Milwaukee, Wis	......	......	1	......	......	35	......	7	1	45	......	......	......	......	......	......	......	......	......	......

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[1] All work in the fourth district was preformed by the radio inspector of the third district.

Place of inspection or examination.	Stations inspected.					Amateur stations licensed.	Operators examined.						Experiment and instruction.	Operators licensed.						
							Commercial.			Amateur.				Commercial.			Amateur.			
	Ship—Voluntary equipment.	Ship for license.	Land.	Land for license.	General and restricted amateur.		Extra, first.	First.	Second.	First.	Second.	Cargo.		Extra, first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.
Ninth district—Continued.																				
Minneapolis, Minn			1					15	12	55										
Omaha, Nebr			2	1				5	3	23			1							
St. Louis, Mo			2					5	1	9										
St. Paul, Minn			1																	
Valparaiso, Ind			1																	
Total, 1921	10	9	16	6	2	1,534		266	45	518	1,050		7		97	65	309	1,050		7
Total, 1920	16	1				872	2	528	6	300	642		11	1	227	101	269	642		11
SUMMARY.																				
First district	68	63	11	12	9	789	7	514	21	356	449	2	2	5	244	90	346	449	2	2
Second district	97	101	31	18	2	794	3	383	525	450		21		1	575	224	395	387	15	
Third district	65	78	7	5	36	1,427	1	997	110	497		1	1	3	395	137	481	460	1	1
Fourth district						184		9	8	11					1	1	3	117		
Fifth district	41	39	6	2	26	253		232	155	80	219	1	1	3	169	53	61	219	1	10
Sixth district	97	89	19	12	9	629	4	440	36	438	212	16	4	3	282	56	301	230	15	4
Seventh district	48	52	15	11	7	303	2	243	96	135	245	2		1	155	52	114	218	2	
Eighth district	88	32	40	30	7	1,438	1	189	21	515	584		9		73	37	378	689		9
Ninth district	10	9	16	6	2	1,534		266	45	518	1,050		7		97	65	309	1,050		7
Grand total, 1921	514	463	145	96	98	7,351	18	3,273	1,017	3,000	2,759	43	24	16	1,991	715	2,388	3,819	36	33
Grand total, 1920	1,171	793	45	55	432	5,719	26	6,645	1,287	3,360	2,352	17	62	16	3,503	1,367	2,888	3,215	30	152

Selection from

ANNUAL REPORT

OF THE

COMMISSIONER OF NAVIGATION

TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1922

WASHINGTON
GOVERNMENT PRINTING OFFICE
1922

RADIO COMMUNICATION.

During the past year much has been done to improve apparatus used for radio communication and to extend the scope of its usefulness. Transmitters and receivers have been greatly improved, with the result that a much greater number of transmitting stations can now be operated in a close proximity than was possible only a few years ago and signals can be received over much greater distances. Perhaps in no other line of endeavor has there been more activity and progress through improvement of apparatus and extension of the field of service.

The bureau has no way of determining the amount of money invested in this enterprise, but it doubtless will run into several hundred million dollars and affords employment to a very large number of people. It is not expected that radio will ever supplant our land wire or cable systems, but it already is used to a considerable extent for communication between points where the land wire systems are difficult to maintain or between points where it is physically impossible or too expensive to construct such systems.

TRANSOCEANIC SERVICE.

The constant improvements being made in this method of communication have resulted in a marked extension of the services not only throughout the United States, but for international communication. During the fiscal year just ended seven additional commercial transoceanic transmitters were placed in operation providing at the present time for this means of communication with the following countries: Great Britain, Italy, France, Germany, Norway, Poland, and Japan. Plans are under way for the extension of this means of communication to China and South America.

In addition to the above international services we have a commercial station which provides a means for communicating with several points in Central America.

BROADCASTING SERVICE.

The largest and most unexpected development in radio has been in the broadcasting service. At the beginning of the year this service was being carried on by a few stations in an experimental way only and it was not until about the middle of the year that the possibilities and importance of this service were fully appreciated. Broadcasting is a natural function of radio in that signals sent out from a transmitter may be received in all directions and although this service may be said to be only in the experimental or development stage there were licensed at the end of the fiscal year 382 broadcasting radio transmitting stations, two of which are in Hawaii and one in Porto Rico.

This service is furnished the public without cost. They are being operated by electrical companies, newspapers, department stores, educational institutions, and State or municipal governments.

These stations are at present furnishing musical entertainment, lectures on varied subjects, sermons, Government reports, time signals, and weather forecasts.

The signals from some of the most powerful of these stations have been received at times over distances of several hundred miles, which makes it incumbent that due consideration be given to the power, wave lengths, and range of such stations, else they may seriously conflict with the operation of radio stations beyond our northern and southwestern borders.

As stations used for receiving only are not required by law to be licensed, the bureau has no record of the number of such stations in use but the information furnished the bureau indicates that there are at a conservative estimate 600,000 such stations now being used with the prospects of rapid and continued growth if the service can be properly regulated.

NEW LEGISLATION.

Existing law, designed primarily to regulate wireless as a life-saving device on ships at sea, to prevent unnecessary interference between operating stations and place them in charge of competent operators necessarily is inadequate to meet the conditions brought about by the broadcasting service and the increase in the use of this means of communication. At the suggestion of the President, therefore, a radio conference of the foremost radio experts of the Government with men of recognized attainment in the scientific field was held the latter part of February. There was laid before and approved by this conference a bill carrying out the recommendations of the conference which was introduced in the Senate and the House on June 9, 1922. In drafting this bill it was recognized that before it could become law the rapidly advancing conditions of the art might render any specific technical regulations obsolete. The proposed legislation, therefore, was drawn in most general terms in order that the regulations might be changed as the art itself changed. This could only be done by conferring on the Secretary of Commerce, having jurisdiction of the administration of the law, broad powers of supervision, regulation, and control. It is more or less an emergency measure, the act to regulate radio communication of August 13, 1912, remaining the basic law upon the subject.

INTERNATIONAL CONVENTION.

The need for a revision of the International Radiotelegraph Convention is recognized. All transoceanic and ship radio stations must operate in accordance with the terms of this agreement. When the last international conference was held in London in 1912 we had only one transoceanic station which had at that time been used only to a limited extent for commercial communication with Germany and the matter of allocating wave lengths was not given consideration. This is one of the most important problems to be decided at the next conference, which will probably be held in Paris during 1923.

In 1912 commercial vessels were using only the wave lengths of 300, 450, and 600 meters for communication, but with the development of new types of apparatus and the increasing use of radio for ship-to-ship and ship-to-shore communication it is necessary that this means of communication on longer wave lengths and over greater distances be provided for in the international agreement. At the present time ships in the transoceanic service using the better type of equipment are able to maintain communication with land during the entire voyage, and in order that this important service may be carried on in an orderly manner suitable provisions to insure this should be embraced in the next convention.

AMATEUR SERVICE.

There has been a marked increase in the growth of amateur stations during the past year. At the end of the last fiscal year we had 10,809 licensed amateur stations and we now have 15,504 such stations, which is an increase of nearly 50 per cent for the year just ended.

The increase of 4.695 amateur stations during the year is gratifying. These operators constitute a reserve trained in the use and in many instances the construction of radio stations and apparatus. Some of the most useful contributions to the radio art have been made by men who but recently were classed as amateurs, while during the recent war they were found much superior to the average commercial operator in resourcefulness and technical knowledge.

INSPECTION SERVICE.

The rapid and continued growth of radio naturally makes it more difficult to prevent serious interference between radio stations and radio services. Until recently our inspection force has not found it necessary to give much attention to inland stations except where such stations interfered seriously with the operation of coast stations working with ships or with ship communication. It is now essential in order that orderly operation may be accomplished that inspectors cover their district, which includes every State in the Union as well as Alaska, Hawaii, and Porto Rico, at regular intervals for the purpose of inspecting stations, licensing operators, and preventing unnecessary, willful, or malicious interference. This naturally means an increase in this force. Otherwise serious complaints can not have the attention expected and deserved.

The ship-to-shore and ship-to-ship service remains the most important in that it provides protection to life and property. Therefore the services of the inspectors can not be withdrawn from the work of careful and thorough inspection of shipboard stations, which stations, experience has shown, should be inspected as far as possible before each sailing of the vessel in the transoceanic service or between ports 200 miles or more apart. The apparatus is delicate and susceptible to disarrangement because of vibration on shipboard, and the operators employed in most cases are not qualified to make the proper tests and repairs and are not supplied with the necessary inspection instruments to determine the efficiency of the apparatus, and it is only through regular inspections by competent men that the lives of passengers and crew can be properly safeguarded.

PERSONNEL.

The growth of the commercial use of radio has naturally created an unusual demand for radio experts with the result that many of the old employees have become separated from our service to accept better pay in the commercial field.

To provide additional men to fill vacancies and for the new positions made possible by the increased appropriation of $50,000 authorized for the present fiscal year the Civil Service Commission was requested to hold an examination to secure a list of eligibles. As a result of 2 examinations but 10 eligibles were secured. The lack of interest in these examinations undoubtedly is due to the salary offered in these positions, which ranges from $1,800 to $2,200 per annum for the entrance grades, while the higher grades are considerably below those offered in the commercial field.

If the bureau is to obtain and retain efficient men now in the service, substantial increases in the salaries must be provided. The inspectors in the service are required to inspect all classes of transmitting stations from the amateur to the transoceanic. They must be qualified to pass upon the efficiency of such stations, solve problems arising in their operation so far as covered by law, and must have qualifications equal to if not superior to men in the commercial field with whom they are required to transact business and to advise. If this important problem can not be solved promptly through reclassification, immediate provision should be made to adjust these salaries.

Unlike most other services of a scientific or technical nature, the radio service is changing rapidly, necessitating constant research and study on the part of the inspectors in order to keep abreast of the development and to acquire the knowledge necessary to intelligently pass upon the efficiency of the apparatus and to properly apply the aw and regulations.

SCOPE OF WORK.

Under authority of the act of June 24, 1910, amended July 23, 1912, the radio inspectors are required to determine whether or not the radio equipment on shipboard is in efficient operating condition capable of transmitting and receiving messages over a distance of at least 100 miles day or night, if an auxiliary power supply independent of the vessel's main power plant is provided, if efficient communication between the radio room and the bridge is provided, and if the station is in charge of two or more persons skilled in the use of radio apparatus and under the provisions of the act to regulate radio communication approved August 13, 1912, radio operators are examined and licensed and radio transmitting stations are inspected and licensed and as far as possible interference between stations is prevented.

There has been a material increase in all of the above duties.

The following table gives comparative figures for the years 1914 to 1922, inclusive, and indicates the steady increase during this period as well as the small increase of personnel in the field force:

June 30—	American ships equipped.	American ships licensed.	Inspections of American and foreign ships.	Commercial operators licensed.	Commercial and special land stations.	Amateur stations licensed.	Amateur operators licensed.	Total field force.
1914	555	203	6,484	339	83	2,137	1,172	20
1915	585	362	6,152	1,653	115	3,547	3,067	26
1916	604	444	7,236	1,278	182	4,942	4,199	28
1917	836	484	7,137	1,682	160	3,741	3,302	28
1918	1,478	392	5,575	1,616	....	....	....	29
1919	2,312	976	5,160	1,645	....	....	....	27
1920	2,808	1,158	5,419	4,652	254	5,719	5,988	25–45
1921	2,978	921	5,591	2,722	491	7,351	6,207	26
1922	2,773	1,174	6,071	3,136	1,086	9,525	8,920	35

STATION AND OPERATORS' LICENSES.

The following table shows the number and classification of the radio stations in the United States on June 30, 1921 and 1922, and the number and rating of licenses issued to operators from 1914 to June 30, 1922.

Comparison shows the extent of the growth in the use of radio apparatus for the transmission of messages and in the number of operators' licenses issued.

Classification.	Number.		Grade.	Number, 1914–1922, inclusive.
	1921	1922		
RADIO STATIONS.			RADIO OPERATORS.	
Commercial land radio stations	161	575	Commercial extra first	126
Commercial ship radio stations	2,978	2,773	Commercial first and second	18,843
Government land radio stations [1]	227	284	Experiment and instruction	250
Government ship radio stations	1,158	1,194	Cargo	644
Special land radio stations	418	511	Amateur first and second	32,970
Amateur stations licensed	10,809	15,504	Commercial emergency first and second	563
Total	15,751	20,841	Total	53,396

[1] Includes 45 light-vessel stations.

COST OF RADIO SERVICE.

The following statement shows the expenditures in detail for the Radio Service for 1922, the appropriation for the current year and the proposed allotment, and the estimates for the year ending June 30, 1924:

	1922	1923	1924
Total salaries:			
Field	$60,887.18	$96,500.00	$114,025.00
Bureau	10,683.14	17,600.00	17,600.00
Total	71,570.32	114,100.00	131,625.00
General expenses:			
Rent	1,080.00	1,380.00	1,380.00
Travel	3,402.51	8,550.00	10,000.00
Telephone	850.52	1,260.00	1,260.00
Furniture	104.92	550.00	500.00
Supplies	1,526.67	715.00	1,000.00
Printing	299.58	250.00	300.00
New instruments	210.30	1,860.00	2,500.00
Repairs	224.85	250.00	300.00
Telegrams	42.79	90.00	90.00
Freight	136.84	200.00	200.00
Car fare	377.51	545.00	545.00
Batteries, wire, etc.	41.40	150.00	200.00
Berne publications	65.77	50.00	50.00
Miscellaneous	64.80	50.00	50.00
Unexpended	1.22	....	....
Total	80,000.00	130,000.00	150,000.00

OPERATORS' LICENSES.

The total number of operators' licenses issued during the past year was 12,113 out of a total of 46,990 issued or renewed during the past seven years and shows an increase during 1922 of 3,115 over the number licensed the previous year.

Grade.	1916	1917	1918	1919	1920	1921	1922	Total.
Commercial extra first	18	8	13	18	16	16	19	108
Commercial first and second	1,260	1,674	1,603	1,640	4,869	2,706	3,117	16,869
Experiment and instruction	30	10	(1)	(1)	97	33	43	213
Cargo	173	113	107	33	30	36	14	506
Amateur first and second	4,199	3,303	(1)	(1)	6,103	6,207	8,920	28,731
Commercial emergency, first, and second	....	217	219	63	64	....	....	563
Total	5,680	5,324	1,942	1,754	11,179	8,998	12,113	46,990

[1] Discontinued for the period of the war.

DETAILED WORK OF THE RADIO SERVICE.

The following statement shows the details of the work performed by radio inspectors during the past fiscal year in comparison with the work of the previous year:

Work of service.	1921	1922
Clearance of American and foreign vessels required by law to be equipped with radio	9,581	10,240
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	5,591	6,071
Inspections of radio equipment on voluntarily equipped vessels	514	869
American ship radio stations licensed	921	1,174
American ship radio stations inspected for license	463	688
Land radio stations inspected for license	96	285
Land radio stations (not including amateur stations)[1]	491	....
Special land radio stations (not including amateur stations)	....	511
Commercial land stations[2]	....	193
Limited commercial (broadcasting) stations	....	382
Amateur radio stations licensed	7,351	9,525
Commercial operators examined	4,308	3,236
Commercial operators licensed	2,722	3,136
Amateur operators examined	5,759	8,107
Amateur operators licensed	6,207	8,920
Defects found upon inspection of ship radio stations where clearance would have been in violation of the law	553	247
American vessels equipped with radio	2,978	2,773

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[1] Land stations are divided into three classes for the year 1922.

[2] Includes 20 Philippine insular government stations.

SUMMARY OF WORK BY DISTRICTS.

Following is the usual statement by districts of the work performed by the districts during the past fiscal year as well as a comparison with the work performed during the previous year.

Place of inspection or examination.	Stations inspected.					Amateur stations licensed.	Operators examined.							Operators licensed.						
							Commercial.			Amateur.				Commercial.			Amateur.			
	Ship—Voluntary equipment.	Ship for license.	Land.[1]	Land for license.[1]	General and restricted amateur.		Extra first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.	Extra first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.
First district:																				
Boston, Mass	26	25	9	7	3	1,406	0	238	2	326	463	2	3	0	199	63	702	539	2	3
Bath, Me	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Providence, R. I	3	3	3	4	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	0
New London, Conn	0	0	2	5	3	0	0	4	0	19	0	0	0	0	4	1	17	1	0	0
Hartford, Conn	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rochester, Me	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lowell, Mass	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	4	0	0	0
New Haven, Conn	0	0	0	1	2	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0
Litchfield and Greenwich, Conn	0	0	0	1	1	0	0	0	0	2	0	0	0	0	0	0	9	0	0	0
Worcester, Mass	0	0	2	0	1	0	0	0	0	2	0	0	0	0	0	0	3	0	0	0
Fall River, Mass	0	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	11	0	0	0
New Bedford, Mass	0	0	0	1	1	0	0	0	0	22	0	0	0	0	0	0	18	0	0	0
Total, 1922	30	29	16	24	14	1,406	0	245	2	397	463	2	3	0	203	65	765	540	2	3
Total, 1921	68	63	11	12	9	789	7	514	21	356	449	2	2	5	244	90	346	449	2	2
Second district:																				
New York, N. Y	337	373	100	41	19	803	4	370	249	861	0	12	0	7	699	136	674	167	7	0
Total, 1922	337	373	100	41	19	803	4	370	249	861	0	12	0	7	699	136	674	167	7	0
Total, 1921	97	101	31	18	2	794	3	383	525	450	0	21	0	1	575	224	395	387	15	0
Third district:																				
Baltimore, Md	47	44	24	40	61	1,792	1	263	57	135	0	0	2	2	370	81	720	397	0	10
Norfolk and Newport News, Va	59	42	6	6	3	0	0	35	16	15	0	0	0	1	62	12	17	0	0	0
Philadelphia, Pa	0	0	18	8	95	0	0	188	10	338	0	0	0	0	1	0	0	0	0	0
Total, 1922	106	86	48	54	159	1,792	1	486	83	488	0	0	2	3	433	93	737	397	0	10
Total, 1921	65	78	7	5	36	1,427	1	997	110	497	0	1	1	3	395	137	481	460	1	1
Fourth district:																				
Savannah, Ga	0	0	1	1	3	235	0	14	4	6	0	0	0	0	12	18	115	142	0	0
Charlotte, N. C	0	0	2	2	4	0	0	1	3	7	0	0	1	0	0	0	0	0	0	0
Charleston, S. C	0	0	0	0	0	0	0	7	2	2	0	0	0	0	0	0	0	0	0	0
Jacksonville, Fla	0	0	0	0	1	0	0	7	5	15	0	0	0	0	0	0	0	0	0	0
Tampa, Fla	0	0	1	1	2	0	0	9	3	2	0	0	0	0	0	0	0	0	0	0

Atlanta and Decatur, Ga	0	0	4	3	4	0	0	10	12	39	0	0	0	0	0	0	0	0	0	0
Wilmington, N. C	2	2	0	0	6	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0
Total, 1922	2	2	8	7	20	235	0	48	29	75	0	0	1	0	12	18	115	142	0	0
Total, 1921	0	0	0	0	0	184	0	9	8	11	0	0	0	0	1	1	3	117	0	0
Fifth district:																				
New Orleans, La	123	70	9	13	54	460	0	205	35	46	385	0	0	1	217	47	52	378	0	5
Burrwood, La	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobile, Ala	8	6	1	1	12	0	0	8	4	12	0	0	0	0	0	1	5	0	0	0
Forth Worth, Tex	0	0	3	1	6	0	0	13	2	25	0	0	0	0	1	2	15	0	0	0
Dallas, Tex	0	0	2	0	5	0	0	6	2	22	0	0	0	0	0	0	11	0	0	0
Austin, Tex	0	0	8	1	2	0	0	2	6	11	0	0	0	0	0	0	6	7	0	0
San Antonio, Tex	0	0	4	1	10	0	0	12	2	14	0	0	0	0	0	2	10	0	0	0
Galveston, Tex	5	5	0	0	1	0	0	5	0	5	0	0	0	0	1	0	5	0	0	0
Houston, Tex	1	0	5	2	4	0	0	8	1	16	0	0	0	0	2	1	12	0	0	0
Beaumont, Tex	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Port Arthur, Tex	6	6	0	0	0	0	0	2	1	1	0	0	0	0	0	1	1	0	0	0
Fort Morgan, Ala	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Birmingham, Ala	0	0	1	1	9	0	0	13	5	12	0	0	0	0	1	5	10	0	0	0
Montgomery, Ala	0	0	0	0	5	0	0	2	0	14	0	0	0	0	0	0	12	0	0	0
Total, 1922	145	89	30	21	108	460	0	274	58	178	385	0	0	1	222	59	139	385	0	5
Total, 1921	41	39	6	2	26	253	0	232	155	80	219	1	1	3	169	53	61	219	1	10
Sixth district:																				
San Francisco, Calif	38	31	14	4	5	708	1	364	27	501	245	4	6	4	387	69	447	260	4	9
Honolulu, Hawaii	0	0	0	0	0	0	0	35	0	26	0	0	0	1	38	8	17	0	0	0
Los Angeles, Calif	2	1	7	0	1	0	0	36	3	142	0	0	0	0	0	0	0	0	0	0
San Diego, Calif	2	0	2	0	1	0	0	1	3	38	0	0	0	0	0	0	0	0	0	0
Avalon, Calif	1	1	3	0	0	0	0	0	0	3	0	0	0	0	3	0	0	0	0	0
Fresno and Santa Barbara, Calif	0	0	3	0	2	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0
Total, 1922	43	33	29	4	9	708	1	439	33	713	245	4	6	5	428	77	464	260	4	9
Total, 1921	97	89	19	12	9	629	4	440	36	438	212	16	4	3	282	56	301	230	15	4
Seventh district:																				
Seattle, Wash	22	34	33	32	5	242	1	197	101	212	241	1	0	2	187	67	179	269	1	0
Total, 1922	22	34	33	32	5	242	1	197	101	212	241	1	0	2	187	67	179	269	1	0
Total, 1921	48	52	15	11	7	303	2	243	96	135	245	2	0	1	155	52	114	218	2	0
Eighth district:																				
Detroit, Mich	116	8	32	22	33	1,956	0	97	15	157	828	0	3	0	96	30	271	974	0	4
Toledo, Ohio	0	0	6	5	0	0	0	5	5	44	0	0	0	0	2	0	25	0	0	0
Cleveland, Ohio	10	6	6	4	2	0	0	38	11	212	0	0	0	0	8	11	122	0	0	0
Pittsburgh, Pa	0	0	9	8	1	0	0	27	3	219	0	0	0	0	5	8	156	0	0	0
Buffalo, N. Y	5	6	6	6	0	0	0	23	2	112	0	0	0	0	4	5	71	0	0	0
Lansing, Mich	0	0	1	1	0	0	0	1	0	54	0	0	0	0	1	0	45	0	0	0
Rochester, N. Y	0	0	1	1	0	0	0	7	0	43	0	0	0	0	4	0	27	0	0	0
Dayton, Ohio	0	0	3	3	3	0	0	16	6	96	0	0	0	0	5	7	60	0	0	0

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[1] Coast, inland, and special land stations.

Place of inspection or examination.	Stations inspected.					Amateur stations licensed.	Operators examined.							Operators licensed.						
							Commercial.			Amateur.		Cargo.	Experiment and instruction.	Commercial.			Amateur.		Cargo.	Experiment and instruction.
	Ship—Voluntary equipment.	Ship for license.	Land.	Land for license.	General and restricted amateur.		Extra first.	First.	Second.	First.	Second.			Extra first.	First.	Second.	First.	Second.		
Eighth district—Continued.																				
Cincinnati, Ohio	0	0	10	10	1	0	0	5	2	53	0	0	0	0	4	1	39	0	0	0
Columbus, Ohio	0	0	10	10	4	0	0	3	0	100	0	0	1	0	0	1	71	0	0	0
Frankfort, Mich	3	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ludington, Mich	3	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sandusky, Ohio	0	0	0	0	2	0	0	0	0	18	0	0	0	0	0	0	16	0	0	0
Total, 1922	137	26	86	72	46	1,956	0	222	44	1,098	828	0	4	0	129	63	894	974	6	4
Total, 1921	88	32	40	30	7	1,438	1	189	21	515	584	0	9	0	73	37	378	689	0	9
Ninth district:																				
Chicago, Ill	47	16	1	17	0	1,923	0	236	15	395	1,256	0	6	1	143	83	563	1,256	0	12
Milwaukee, Wis	0	0	1	0	2	0	0	7	0	19	0	0	0	0	0	0	0	0	0	0
Racine and Kenosha, Wis	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Indianapolis, Ind	0	0	1	2	2	0	0	11	1	36	0	0	0	0	0	0	0	0	0	0
St. Louis, Mo	0	0	2	4	1	0	0	7	0	53	0	0	0	0	0	0	0	0	0	0
Kansas City, Mo	0	0	0	4	2	0	0	13	2	26	0	0	0	0	0	0	0	0	0	0
Omaha, Nebr	0	0	1	2	1	0	0	4	3	24	0	0	0	0	0	0	0	0	0	0
Rock Island, Ill	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Davenport, Iowa	0	0	1	0	0	0	0	0	3	22	0	0	0	0	0	0	0	0	0	0
Minneapolis, Minn	0	0	4	1	1	0	0	22	16	74	0	0	1	0	0	0	0	0	0	0
Duluth, Minn	0	0	0	0	0	0	0	6	0	18	0	0	0	0	0	0	0	0	0	0
Total, 1922	47	16	13	30	16	1,923	0	306	43	667	1,256	0	7	1	143	83	563	1,256	0	12
Total, 1921	10	9	16	6	2	1,534	0	266	45	518	1,050	0	7	0	97	65	309	1,050	0	7
Summary:																				
First district	30	29	16	24	14	1,406	0	245	2	397	463	2	3	0	203	65	765	540	2	3
Second district	337	373	100	41	19	803	1	370	219	861	0	12	0	7	699	136	674	167	7	0
Third district	106	86	48	54	159	1,792	1	486	83	488	0	0	2	3	433	93	737	397	0	10
Fourth district	2	2	8	7	20	235	0	48	29	75	0	0	1	0	12	18	115	142	0	0
Fifth district	145	89	30	21	108	460	0	274	59	178	385	0	0	1	222	59	139	385	0	5
Sixth district	43	33	29	4	9	708	1	439	33	713	245	4	6	5	428	77	464	260	4	9
Seventh district	22	34	33	32	5	242	1	197	101	212	241	1	0	2	187	67	179	269	1	0
Eighth district	137	26	86	72	46	1,956	0	221	44	1,098	828	0	4	0	129	63	894	974	0	4
Ninth district	47	16	13	30	16	1,923	0	306	43	667	1,256	0	7	1	143	83	563	1,256	0	12
Grand total, 1922	869	688	363	285	396	9,525	7	2,586	643	4,689	3,418	19	23	19	2,456	661	4,530	4,390	14	43
Grand total, 1921	514	463	145	96	98	7,351	18	3,273	1,017	3,000	2,759	43	24	16	1,991	715	2,388	3,819	36	33

Selection from

ANNUAL REPORT

OF THE

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TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1923

WASHINGTON
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1923

RADIO COMMUNICATION.

The statistical records of the bureau show a general increase in radio activity during the fiscal year just closed. The largest increases are shown in the broadcasting and amateur services, while in the marine service the number of clearances and inspections exceed any year since the beginning of the war (1917).

INTERNATIONAL SERVICE.

Nine international radio circuits are now being operated between this country and Europe and Japan. It is stated that from 20 to 30 per cent of all message business between America and Europe was handled by radio, and 50 per cent of the trans-Pacific business was handled by radio during 1922. In addition to the above, a valuable radio channel exists between this country and Central America.

RADIO CONFERENCE.

The second radio conference, called by the Secretary of Commerce, met in Washington on March 20 to consider what could be done from an administrative point of view to lessen the amount of interference in radio broadcasting.

The members of the conference unanimously recommended a reallocation of wave lengths for broadcasting and other services. As far as practicable, the wave lengths recommended were put into effect on May 15, and the broadcasting stations placed in three classes; Class A stations assigned wave lengths from 222 to 286 meters; class B stations assigned wave lengths from 300 to 345 and 375 to 545 meters; class C stations are confined to 360 meters only.

Under the new arrangement each locality has an individual wave length for class B stations, with the possibility of simultaneous operation of three stations, one of each class, in any city or locality.

The close subdivision of wave lengths necessitates accurate adjustment of the transmitters, frequent inspection, and close observation by our inspectors to prevent interference and insure the advantages made possible by the readjustment now in effect.

NEW LEGISLATION.

The radio bill designed to give to the Secretary of Commerce the authority needed to better control radio communication, which was introduced in the last session of Congress, was passed by the House, but was not taken up for consideration by the Senate. The need for new legislation, such as recommended last year, has not diminished.

The radio conference of last year recognized the inadequacy of the existing law which was passed in 1912 and approved the bill which failed to pass.

When the act of 1912 was passed, the transoceanic service was in the experimental stage. There were only 4 point to point stations, no broadcasting stations, and only 480 commercial ship stations and 1,312 amateur stations.

The extended use of radio and the rapid development in types of equipment since 1912 makes it very difficult to apply the old law to the new conditions. More adequate and flexible control is urgently needed.

BROADCASTING SERVICE.

The broadcasting service continues to hold the interest of the public, and its permanency seems assured. Its real value has not yet been fully realized and will not be until there has been a wider distribution of receiving sets suitable for the reception of varied programs from several stations, permitting the listener to select at will the class of service of greatest interest or value.

Broadcasting carries to the country home many of the advantages enjoyed by the city dweller which have heretofore been unobtainable. The facilities needed to enjoy this service are simple, and the cost range is similar to that of phonographs.

There are 573 licensed broadcasting stations in the United States, Alaska, Hawaii, and Porto Rico, furnishing varied programs of music, lectures, sermons, news, weather forecasts, market information, and other matter of public interest. The programs, schedules, call letters and wave lengths printed in the daily papers give the listeners opportunity to select such stations or such features as they may prefer. Perhaps no class of listeners get more enjoyment from broadcasting than the shut-ins or invalids, with the possible exception of the blind.

BROADCASTING IN OTHER COUNTRIES.

Broadcasting stations have been established in several foreign countries, but in no other country is this service used so extensively as in the United States.

The nature of the service performed is similar to that given by stations in this country, but the regulations governing the use of foreign stations are much more strict.

Of the foreign countries Canada ranks first in the number of transmitting broadcasting stations, having 30, with 11,770 stations licensed to receive the programs.

Great Britain has at present six transmitting broadcasting stations, with two more contemplated. The stations now operating are at London, Manchester, Birmingham, Cardiff, Newcastle, and Glasgow.

It is reported that the Radio Association of Listeners-in in Great Britain has demanded the elimination of the existing monopolistic system and the substitution therefor of a system of free wireless competition such as exists in the United States. The popularity of this service in Great Britain compares favorably with the United States, as it appears that licenses have been issued for approximately 115,000 receiving stations.

France has five stations transmitting entertainment, news, and meteorological information. These stations are located at Paris, Levallois-Perret, Ecole Superieure des Posts and Telegraphs, Nice, and Lyons.

Holland has six stations, four of which are at The Hague. The other two are at Ijmuiden and Amsterdam. These stations are broadcasting concerts and miscellaneous information.

Germany has two stations, one at Berlin and the other at Eberswalde, transmitting news, concerts, lectures, etc.

Czechoslovakia has one station at Prague transmitting meteorological bulletins, news, and concerts.

Switzerland has two stations, one at Geneva and the other at Lausanne, transmitting concerts.

Belgium has one station, Brazil one station, Chile three stations. In Chile it is estimated there are between 100 and 500 receiving sets in use.

China, Cuba, Japan, Mexico, Norway, and Philippine Islands have one station each. In Sweden a company has been organized and capitalized at $170,000 for broadcasting.

MARINE SERVICE.

The ship-inspection work remains the most important duty performed by the radio service. Every reasonable effort is made to inspect the radio installation on all American and foreign vessels carrying 50 or more persons and running 200 miles or more between ports before each clearance to insure the safety of the passengers and crew, as required by section 1, act of July 23, 1912.

During the fiscal year just ended there were 11,305 clearances and 6,933 inspections of vessels coming under the above-mentioned act, as compared with 10,240 clearances and 6,071 inspections for the fiscal year 1922, or an increase of 1,065 clearances and 862 inspections for 1923, which exceeds any year since the beginning of the war (1917).

These inspections developed 343 cases of inefficient apparatus or other defects which would have constituted violations of the law had the vessels sailed under the conditions as found at the time of inspection.

AMATEUR SERVICE.

Amateur stations continue to increase in number. There are now 16,570 licensed amateur stations as compared with 15,504 in 1922, an increase of 1,066 during the past year.

The Radio Conference, referred to under another heading, recommended a change in wave lengths for amateur stations. The amateurs are permitted to use the band of wave lengths from 150 to 200 meters, and special amateur stations are given use of the band from 150 to 220 meters, with restrictions as to transmitting equipment in each class.

Amateur stations are required to observe a silent period from 8 to 10.30 p. m. daily and during Sunday morning church services to permit uninterrupted reception of the broadcast service so far as the amateurs are involved. The amateurs are making all reasonable effort to improve and perfect their transmitters. The progress already made is noteworthy.

Considering the number of amateur stations, the age of the operators, and the inability of our inspectors to get in personal touch with the majority of them it is essential that our service have the close cooperation they are giving us. Their respect for the law and rights of others is commendable.

INTERNATIONAL CONVENTION.

The date of holding the next International Radio Conference is indefinite. Some tentative plans were made to hold the conference in Paris last year, but a postponement was found necessary. The existing convention needs revision to provide for the changes in service and development of equipment which has taken place during the past 10 years.

INSPECTION SERVICE.

Our inspection duties are increasing and becoming more exacting. The reallocation of wave lengths which became effective on May 15, 1923, based upon the recommendation of the Second Radio Conference, makes use of a closer subdivision of wave lengths. Individual wave lengths are assigned to class A and class B broadcasting stations. Some of these wave lengths are very close to the ship waves and the waves used by other services. The successful operation of all of these stations requires frequent inspections, proper adjustment, and constant observation.

As nearly every city of any consequence has a broadcasting station, and there are possibly 2,000,000 persons benefited by this service, it is necessary for our inspectors to cover their districts frequently to investigate complaints of interference.

During the fiscal year 1922 we visited 63 cities on our inspection trips, while during the last fiscal year we visited 301 cities. It was necessary to make several trips to some of the larger cities during the year because of the opening of new stations, to readjust existing stations, and to examine radio operators.

Practically all of our inspection force have receiving stations in their homes, where they listen-in nightly to observe any infractions of the law and to keep personally informed of radio-operating conditions in their districts. As our limited appropriation would not permit us to furnish the receiving equipment needed for this purpose, except to a very limited extent, our supervisors and inspectors have purchased them with their own funds. Their nightly vigil is voluntary in the interest of higher efficiency for the service in their districts. While this voluntary contribution of money and time is commendable, it should not be necessary. Additional personnel and facilities should be provided promptly.

ANNUAL LEAVE.

The opinion prevails quite generally that Government employees enjoy 30 days leave annually. This is not true in the radio service. Leave is computed on the calendar year basis. In 1922 our field inspection force had an average of 11 days, and for the first six months of 1923 they have had an average of three and three-fourths days. These men deserve more time for relaxation. The remedy is an increase in personnel.

COST OF RADIO SERVICE.

The following statement shows the expenditures in detail for the radio service for 1923, the appropriation for the current year and the proposed allotment, and the estimates for the year ending June 30, 1924:

	1923	1924
Total salaries:		
Field	$91,464.28	$99,730.00
Bureau	15,244.36	17,600.00
Total	106,708.64	117,330.00
General expenses:		
Rent	1,380.00	720.00
Travel	11,169.48	14,145.00
Telephone	971.04	1,260.00
Furniture	449.25	550.00
Supplies	1,012.57	1,165.00
Printing	309.46	300.00
New instruments	3,194.32	1,880.00
Repairs	390.55	350.00
General expenses—Contd.		
Telegrams	$174.15	$200.00
Freight	204.14	200.00
Car fare	497.46	725.00
Batteries, wire, etc	595.02	325.00
Berne publications	44.26	50.00
Office machines and devices	823.19	
Other equipment	965.46	
Unexpended	1,111.01	
Total	23,291.36	21,870.00
Grand total	130,000.00	139,200.00

SCOPE OF WORK.

The field of activity of the radio service embraces the United States, Alaska, Hawaii, and Porto Rico. It extends to the inspection, licensing, and orderly operation of 12 stations engaged in international communication, 45 coast stations working with ships, 2,723 American ship stations exclusive of the stations on all foreign vessels entering our ports carrying 50 or more persons, 179 point-to-point commercial stations, 573 broadcasting stations, 281 experimental stations, 127 technical and training school stations, 178 special amateur stations, 16,570 general and restricted amateur stations, and examining and licensing the operators for all of these stations; the investigation of complaints of interference, solving technical problems, coordinating radio activities, preventing violations of the law, and assisting anyone requiring advice or information relating to the use of radio for commercial or private purposes.

June 30—	American ships equipped.	American ships licensed.	Inspections of American and foreign ships.	Commercial operators licensed.	Commercial and special land stations.	Amateur stations licensed.	Amateur operators licensed.	Total field force.
1914	555	203	6,484	339	84	2,137	1,172	20
1915	585	362	6,152	1,653	115	3,547	3,087	26
1916	604	444	7,236	1,278	182	4,942	4,199	28
1917	836	484	7,137	1,682	160	3,741	3,302	28
1918	1,478	392	5,575	1,616	....	....	....	29
1919	2,312	976	5,160	1,615	....	....	....	27
1920	2,808	1,158	5,419	4,652	254	5,719	5,988	25–45
1921	2,978	921	5,591	2,722	491	7,351	6,207	26
1922	2,773	1,174	6,071	3,136	1,086	9,525	8,920	35
1923	2,723	945	6,933	2,860	1,375	7,821	9,908	53

STATION AND OPERATORS' LICENSES.

There are 21,967 transmitting radio stations in the United States, including 1,299 operated by the Government as compared with 20,841 last year when the Government had 1,478 stations. These figures also include stations on Government and commercial ships. The following table shows the classification of these stations and the number and rating of licenses issued to operators from 1914 to June 30, 1923.

Classification.	Number.		Grade.	Number (1914–1923, inclusive).
	1922	1923		
RADIO STATIONS.			RADIO OPERATORS.	
Commercial land radio stations	575	809	Commercial extra first	146
Commercial ship radio stations	2,773	2,723	Commercial first and second	21,683
Government land radio stations	[1] 284	[2] 290	Experiment and instruction	292
Government ship radio stations	1,194	1,009	Cargo	651
Special land radio stations	511	566	Amateur first and second	42,878
Amateur stations licensed	15,504	16,570	Commercial emergency first and second	563
Total	20,841	21,967	Total	66,213

[1] Includes 45 light-vessel stations.
[2] Includes 24 light-vessel stations.

OPERATORS' LICENSES.

The total number of operators' licenses issued during the past year was 12,817 out of a total of 59,807 issued or renewed during the past seven years:

Grade.	1917	1918	1919	1920	1921	1922	1923	Total.
Commercial extra first	8	13	18	16	16	19	20	128
Commercial first and second	1,674	1,603	1,640	4,869	2,706	3,117	2,840	19,709
Experimental and instruction	10	(1)	(1)	97	33	43	42	255
Cargo	113	107	33	30	36	14	7	513
Amateur first and second	3,303	(1)	(1)	6,103	6,207	8,920	9,908	38,639
Commercial emergency first and second	217	219	63	64	......	......	......	563
Total	5,324	1,942	1,754	11,179	8,998	12,113	12,817	59,807

[1] Discontinued for the period of the war.

DETAILED WORK OF THE RADIO SERVICE.

The following statement shows the details of the work performed during the past fiscal year compared with 1922:

Work of service.	1922	1923
Clearance of American and foreign vessels required by law to be equipped with radio	10,240	11,305
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	6,071	6,933
Inspections of radio equipment on voluntarily equipped vessels	869	1,124
American ship radio stations licensed	1,174	945
American ship radio stations inspected for license	688	644
Land radio stations inspected for license	285	949
Special land radio stations (not including amateur stations)	511	566
Commercial land stations	[1] 193	236
Limited commercial (broadcasting) stations	382	573
Amateur radio stations licensed	9,525	7,821
Commercial operators examined	3,236	3,131
Commercial operators licensed	3,136	2,860
Amateur operators examined	8,107	8,739
Amateur operators licensed	8,920	9,908
Defects found upon inspection of ship radio stations where clearance would have been in violation of the law	247	343
American vessels equipped with radio	2,773	2,723

[1] Includes 20 Philippine insular government stations.

SUMMARY OF WORK BY DISTRICTS.

Following is the usual statement by districts of the work performed in the districts during the past fiscal year compared with the work performed during the previous year.

Place of inspection or examination (city or town).	Stations inspected.					Amateur stations licensed.	Operators examined.							Operators licensed.						
							Commercial.			Amateur.				Commercial.			Amateur.			
	Ship—Voluntary equipment.	Ship for license.	Land.[1]	Land for license.[1]	General and restricted amateur.		Extra first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.	Extra first.	First.	Second.	First.	Second.	Cargo.	Experiment and instruction.
First district:																				
Boston, Mass.	98	46	24	3	5	766	1	218	15	185	186	......	3	4	151	47	366	273	1	3
Outside district headquarters.	10	4	7	60	31	......	......	8	6	386	......	......	......	......	4	4	259	......	......	......
Total, 1923	108	50	31	63	36	766	1	226	21	571	186	......	3	4	155	51	625	273	1	3
Total, 1922	30	29	16	24	14	1,406	......	245	2	397	463	2	3	......	203	65	755	540	2	3
Second district:																				
New York	444	304	156	84	42	708	1	274	154	752	11	8	......	6	503	109	573	163	3	......
Outside district headquarters.	......	......	24	18	14	......	......	7	20	22	......	......	......	......	2	......	15	......	......	......
Total, 1923	444	304	180	102	56	708	1	281	174	774	11	8	......	6	505	109	588	163	3	......
Total, 1922	337	373	100	41	19	803	4	370	249	861	......	12	......	7	699	136	674	167	7	......
Third district:																				
Baltimore	108	60	58	20	291	759	......	184	21	106	2	......	2	2	255	47	595	252	......	4
Outside district headquarters.	99	45	50	6	525	......	......	150	16	275	......	......	1	......	66	24	128	......	......	......
Total, 1923	207	105	108	26	816	759	......	334	37	471	2	......	3	2	321	71	723	252	......	4
Total, 1922	106	86	48	54	159	1,792	1	486	83	488	......	......	2	3	435	93	737	397	......	10
Fourth district:																				
Savannah	......	3	9	2	2	250	......	3	2	7	27	......	......	......	4	3	28	142	......	......
Outside district headquarters.	1	2	38	18	95	......	......	65	10	130	......	......	......	......	1	......	3	......	......	......
Total, 1923	1	5	47	20	97	250	......	68	12	137	27	......	......	......	5	3	31	142	......	......
Total, 1922	2	2	8	7	20	238	......	48	28	75	......	......	1	......	12	18	115	142	......	......
Fifth district:																				
New Orleans	66	60	24	24	47	592	1	112	23	54	444	......	......	3	190	23	52	444	......	4
Outside district headquarters.	14	15	124	71	247	......	......	123	54	264	......	......	......	......	35	55	175	......	......	......
Total, 1923	80	75	148	95	294	592	1	235	77	318	444	......	......	3	225	78	227	444	......	4
Total, 1922	145	80	30	21	108	460	......	274	59	178	385	......	......	1	222	59	139	385	......	8

Sixth district:																				
San Francisco	71	58	16	26	4	1,129	3	273	45	275	216	2	11	4	346	76	557	349	2	11
Outside district headquarters	3	......	94	75	8	......	......	131	95	328	3	......	......	1	73	62	217	......	......	......
Total, 1923	74	58	110	101	12	1,129	3	404	140	603	219	2	11	5	419	138	774	349	2	11
Total, 1922	43	33	29	4	9	708	1	439	33	713	245	4	6	5	428	77	464	260	4	9
Seventh district:																				
Seattle	35	33	100	93	14	232	......	166	119	215	173	......	......	......	158	76	237	204	......	......
Outside district headquarters	......	......	95	84	3	......	......	44	72	153	......	......	......	......	3	22	80	......	......	......
Total, 1923	35	33	195	177	17	232	......	210	191	368	173	......	......	......	161	98	317	204	......	......
Total, 1922	22	34	33	32	5	242	1	197	101	212	241	1	......	2	187	67	179	269	1	......
Eighth district:																				
Detroit	159	8	26	20	69	1,196	......	170	20	142	751	1	8	......	147	54	398	1,301	1	7
Outside district headquarters	7	3	140	121	79	......	......	79	55	410	37	1	......	......	39	27	194	......	......	......
Total, 1923	165	11	166	141	148	1,196	......	249	75	552	788	1	8	......	186	81	592	1,301	1	7
Total, 1922	137	26	86	72	47	1,956	......	221	44	1,098	828	......	4	......	129	83	894	974	......	4
Ninth district:																				
Chicago	10	3	192	56	12	2,180	1	144	109	499	2,212	......	......	......	143	80	646	2,212	......	13
Outside district headquarters	......	......	221	168	38	......	......	68	69	384	......	......	......	......	4	7	45	......	......	......
Total, 1923	10	3	413	224	50	2,180	1	212	178	883	2,212	......	......	......	147	87	691	2,212	......	13
Total, 1922	47	16	13	30	16	1,923	......	306	43	667	1,256	......	7	1	143	83	563	1,256	......	12
SUMMARY.																				
First district	108	50	31	63	36	766	1	226	21	571	186	......	3	4	155	51	625	273	1	3
Second district	444	304	180	102	56	708	1	281	174	774	11	8	......	6	505	109	588	163	3	......
Third district	207	105	108	26	816	759	......	334	37	471	2	......	3	2	321	71	723	252	......	4
Fourth district	1	5	47	20	97	259	......	68	12	137	27	......	......	......	5	3	31	142	......	......
Fifth district	80	75	148	95	294	592	1	235	77	318	444	......	......	3	225	78	227	444	......	4
Sixth district	74	58	110	101	12	1,129	3	404	140	603	219	2	11	5	419	138	774	349	2	11
Seventh district	35	33	195	177	17	232	......	210	191	368	173	......	......	......	161	98	317	204	......	......
Eighth district	165	11	166	141	148	1,196	......	249	75	552	788	1	8	......	186	81	592	1,301	1	7
Ninth district	10	3	413	224	50	2,180	1	212	178	883	2,212	......	......	......	147	87	691	2,212	......	13
Grand total, 1923	1,124	644	1,398	949	1,526	7,821	7	2,219	905	4,677	4,062	11	25	20	2,124	716	4,568	5,340	7	42
Grand total, 1922	869	688	363	285	307	9,525	7	2,586	643	4,689	3,418	19	23	19	2,456	661	4,530	4,390	14	43

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[1] Coast, inland, and special land stations.

Selection from

ANNUAL REPORT

OF THE

COMMISSIONER OF NAVIGATION

TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1924

WASHINGTON
GOVERNMENT PRINTING OFFICE
1924

RADIO COMMUNICATION

Evidence of the rapidly growing interest in radio is contained in the annual report of one of the large radio companies. According to this report gross sales of radio equipment by this company for the past three calendar years were as follows: 1921, $1,468,919; 1922, $11,286,489; 1923, $22,465,090. This tremendous increase in sales is believed to be due almost entirely to broadcasting which began in September, 1921.

NEW LEGISLATION

During the last session of Congress another unsuccessful effort was made to amend our radio laws. Several radio bills were introduced but none passed. Cooperation has enabled us to function under the existing law without serious hardship to anyone.

MARINE SERVICE

Although the demands made upon our service were greater than any previous year, our ship inspection work was not neglected. There were 7,727 inspections made during the year as compared with

6,933 for the previous year. These inspections developed 299 cases of inefficient apparatus or other defects which would have constituted violations of the law had the vessels sailed under the conditions as found at the time of inspection.

Increased marine traffic resulting in congestion and interference in the vicinity of New York and Boston necessitated a tentative reallocation of wave lengths to the coast stations situated in that section.

The changes were in accordance with recommendations for representatives of the interests involved based upon a practical understanding of the situation.

In the United States there are 37 commercial coast stations working with ships. Of this number 15 are equipped with continuous wave transmitters.

BROADCASTING SERVICE

It seems probable that broadcasting is permanently established as a public necessity and may be considered as indispensable in the average home as the telephone. The broadcasting of the proceedings of the Republican and Democratic conventions demonstrated its value in enabling the public to keep in immediate touch with important events of general interest.

The number of class B stations has increased during the year from 42 to 54, resulting in some difficulty in providing satisfactory operating channels for them within the wave-length band reserved for this class as recommended by the Second National Radio Conference.

During the year class A stations increased from 203 to 378. This increase was offset by the change in class C which was reduced from 327 to 101. A year ago we had 1 class D station. We now have 2. On June 30, 1923, we had a total of 573 broadcasting stations. On June 30, 1924, we had 535, a decrease of 38.

The question of who will pay for broadcasting does not appear to require immediate consideration. The public will probably continue to contribute liberally through cost of equipment purchased. At present there does not appear to be a more equitable way of distributing the cost, while, on the other hand, such stations must have considerable advertising value justifying the expense of operation where owners are not benefited through sales of radio apparatus.

BROADCASTING IN OTHER COUNTRIES

Information concerning the broadcasting service in foreign countries is incomplete. Countries reporting such stations follow: Canada, 44; Cuba, 34; England, 9; France, 5; Mexico, 4; Brazil, 4; Argentina, 3.

AMATEUR SERVICE

The amateur radio operators are searching for new things in radio and they must be given new fields to explore if their interest is to be held. They have succeeded in effecting transcontinental communication and have found it possible to intercommunicate with European stations on short wave lengths. In view of their past achievement it seems proper that they be given a few narrow working and experimental channels below 100 meters to encourage further development.

On June 30, 1924, there were 15,545 licensed amateur stations as compared with 16,570 a year ago.

BROADCAST LISTENERS

The broadcast listener is an unknown quantity. Dependable figures indicating the number of persons deriving pleasure and benefit from this new and fascinating service can not be furnished. Its effect can not be forecast, nor its value estimated. An accurate expression of its views is unobtainable.

INSPECTION SERVICE

Prior to the establishment of the broadcasting service our inspection work was confined almost entirely to the marine service. The advent of broadcasting not only necessitated inspection and careful adjustment of the broadcasting stations, but required an extension of this work to other stations to prevent interference and insure as far as possible satisfactory reception by the broadcast listeners.

During the fiscal year 1923 there were 6,933 inspections made of ship stations. In 1924 the number was increased to 7,727. There were 1,577 inspections made of voluntarily equipped ships as compared with 1,124 the previous year.

For the purpose of inspecting stations, examining operators, and investigating complaints, it was necessary for the field force to visit 355 cities as compared with 301 visited during the previous year. Our appropriation would not permit inspection trips to Alaska, Hawaii, or Porto Rico during the year, although we received reports indicating the need for such trips, especially to Alaska, where interference is experienced to a considerable extent.

COST OF RADIO SERVICE

The following statement shows the expenditures in detail for the radio service for 1924, the appropriation for the current year and proposed allotment, and the estimates for the year ending June 30, 1925.

	1925	1924
Total salaries:		
Field	$135, 500. 00	$99, 256. 03
Bureau	40, 620. 00	16, 542. 59
Total	176, 120. 00	115, 798. 62
General expenses:		
Stationery and office supplies	2, 300. 00	838. 89
Scientific and educational supplies	100. 00	67. 01
Other supplies	275. 00	140. 59
Telegrams	200. 00	184. 88
Telephone	1, 300. 00	1, 218. 74
Postal service	150. 00	
Travel	17, 600. 00	12, 934. 76
General expenses—Con.:		
Transportation of things	$300. 00	$251. 33
Rent	900. 00	728. 50
Repairs	500. 00	310. 71
Other services	100. 00	30. 25
Furniture	850 00	634. 21
Office machines and devices	1, 300 00	769. 37
Scientific instruments and accessories	4, 593 00	4, 930. 46
Other equipment	150. 00	114. 30
Unexpended		247. 38
Total	30, 618. 00	23, 401. 38
Grand total	206, 738. 00	139, 200. 00

SCOPE OF WORK

The following table shows the inspection and licensing work performed yearly from 1914 to 1924, inclusive, and the number of persons employed in the field force:

June 30—	American ships equipped	American ships licensed	Inspections of American and foreign ships	Commercial operators licensed	Commercial and special land stations	Amateur stations licensed	Amateur operators licensed	Total field force
1914	555	203	6, 484	339	83	2, 137	1, 172	20
1915	585	362	6, 152	1, 653	115	3, 547	3, 067	26
1916	604	444	7, 236	1, 278	182	4, 942	4, 199	28
1917	836	484	7, 137	1, 682	160	3, 741	3, 303	28
1918	1, 478	392	5, 575	1, 616	--------	--------	--------	29
1919	2, 312	976	5, 160	1, 645	--------	--------	--------	27
1920	2, 808	1, 158	5, 419	4, 652	254	5, 719	6, 103	25–45
1921	2, 978	921	5, 591	2, 722	491	7, 351	6, 207	26
1922	2, 773	1, 174	6, 071	3, 136	1, 086	9, 525	8, 920	35
1923	2, 723	945	6, 933	2, 860	1, 375	7, 821	9, 908	53
1924	2, 741	1, 382	7, 727	3, 370	1, 802	8, 205	9, 545	53

The following table shows the number of radio operators licensed during the past two years:

OPERATORS LICENSED

Class and grade	1923	1924	Total
Commercial extra first class	20	24	44
Commercial first class	2, 124	2, 627	4, 751
Commercial second class	716	719	1, 435
Experiment and instruction	42	24	66
Cargo	7	8	15
Amateur extra first	--------	147	147
Amateur first	4, 568	4, 832	9, 400
Amateur second	5, 340	4, 566	9, 906
Total	12, 817	12, 947	25, 764

DETAILED WORK OF THE RADIO SERVICE

The following statement shows the details of the work performed during the past fiscal year compared with 1924 and the total number of licensed and Government radio stations:

Work of service	1923	1924
Clearances of American and foreign vessels required by law to be equipped with radio	11,305	10,436
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	6,933	7,727
Inspections of radio equipment on voluntarily equipped vessels	1,124	1,577
American ship radio stations licensed	945	1,382
American ship radio stations inspected for license	644	974
Land stations inspected for license	949	948
Amateur stations licensed	7,821	8,205
Commercial operators examined	3,131	3,204
Commercial operators licensed	2,860	3,370
Amateur operators examined	8,739	7,610
Amateur operators licensed	9,908	9,545
Defects found upon inspection of ship radio stations where clearance would have been in violation of the law	343	299
Licensed and Government radio stations:		
American vessels equipped with radio	2,723	2,741
Special land stations	566	665
Commercial land stations	236	289
Limited commercial (broadcasting) stations	573	535
Amateur stations	16,570	15,545
Government land stations	290	298
Government ship stations	1,009	951

SUMMARY OF WORK BY DISTRICTS

Following is the usual statement by districts of the work performed in the districts during the past fiscal year compared with the work performed during the previous year.

Place of inspection or examination (city or town)	Stations inspected					Amateur stations licensed	Operators examined							Operators licensed						
							Commercial			Amateur				Commercial			Amateur			
	Ship—Voluntary equipment	Ship for license	Land [1]	Land for license [1]	General and restricted amateur		Extra first	First	Second	First	Second	Cargo	Experiment and instruction	Extra first	First	Second	First	Second	Cargo	Experiment and instruction
First district:																				
Boston, Mass	103	61	10	6	13	1,123	0	221	14	197	166	30	1	0	209	49	613	253	17	3
Outside district headquarters	10	5	31	23	19	......	0	2	7	112	0	12	0	0	0	3	81	0	6	0
Total, 1924	113	66	41	29	32	1,123	0	223	21	309	166	42	1	0	209	52	694	253	23	3
Total, 1923	108	50	31	63	36	766	1	226	21	571	186	0	3	4	155	51	625	273	1	3
Second district:																				
New York, N. Y	666	440	150	74	85	477	8	478	61	710	0	17	1	11	702	109	647	38	10	3
Outside district headquarters	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total, 1924	666	440	150	74	85	477	8	478	61	710	0	17	1	11	702	109	647	38	10	3
Total, 1923	444	304	180	102	56	708	1	281	174	774	11	8	0	6	505	109	588	163	3	0
Third district:																				
Baltimore, Md	121	55	85	20	146	828	0	197	28	195	0	0	1	2	257	53	693	158	12	4
Outside district headquarters	20	23	97	12	1,180	0	0	98	15	181	0	23	0	1	47	10	33	0	1	0
Total, 1924	141	78	182	32	1,326	828	0	295	43	376	0	23	1	3	304	63	726	158	13	4
Total, 1923	207	105	108	26	816	759	0	334	37	471	2	0	3	2	321	71	723	252	0	4
Fourth district:																				
Atlanta, Ga	0	0	8	4	3	231	1	19	7	20	86	0	0	0	36	19	68	108	1	0
Outside district headquarters	6	5	27	24	35	0	0	30	21	56	0	2	0	0	0	0	0	0	0	0
Total, 1924	6	5	35	28	38	231	1	49	28	76	86	2	0	0	36	19	68	108	1	0
Total, 1923	1	5	47	20	97	259	0	68	12	137	27	0	0	0	5	3	31	142	0	0
Fifth district:																				
New Orleans, La	49	42	17	8	46	675	1	127	35	87	490	2	0	1	245	37	83	490	2	0
Outside district headquarters	41	32	174	137	275	0	0	143	54	251	0	12	0	0	53	52	186	0	8	0
Total, 1924	90	74	191	145	321	675	1	270	89	338	490	14	0	1	298	89	269	490	10	0
Total, 1923	80	75	118	95	294	592	1	235	77	318	444	0	0	3	225	78	227	444	0	4
Sixth District:																				
San Francisco, Calif	194	118	62	56	18	1,008	4	258	57	279	114	32	6	6	463	38	664	241	37	7
Outside district headquarters	16	10	62	21	22	0	0	169	71	339	0	10	0	1	65	45	110	0	8	0
Total, 1924	210	128	124	77	40	1,008	4	427	128	618	114	42	6	7	528	83	774	241	45	7
Total, 1923	74	58	110	101	12	1,129	3	404	140	603	219	2	11	5	419	138	774	349	2	11

[1] Coast, inland, and special land stations.

Place of inspection or examination (city or town)	Stations inspected					Amateur stations licensed	Operators examined							Operators licensed						
							Commercial			Amateur		Cargo	Experiment and instruction	Commercial			Amateur		Cargo	Experiment and instruction
	Ship—Voluntary equipment	Ship for license	Land	Land for license	General and restricted amateur		Extra first	First	Second	First	Second			Extra first	First	Second	First	Second		
Seventh district:																				
Seattle, Wash	138	115	144	103	21	411	1	218	130	151	148	10	0	2	193	79	134	149	8	0
Outside district headquarters	1	1	48	47	4	0	0	26	29	50	15	6	0	0	15	15	46	15	6	0
Total, 1924	139	116	192	150	25	411	1	244	159	201	163	16	0	2	208	94	180	164	14	0
Total, 1923	35	33	195	177	17	232	0	210	191	368	173	0	0	0	161	98	317	204	0	0
Eighth district:																				
Detroit, Mich	124	36	41	28	8	1,542	0	128	15	78	485	9	2	0	132	43	540	1,125	11	2
Outside district headquarters	29	8	206	180	62	0	0	82	36	281	0	37	1	0	27	26	202	0	18	0
Total, 1924	153	44	247	208	70	1,542	0	210	51	359	485	46	3	0	159	69	742	1,125	29	2
Total, 1923	166	11	166	141	148	1,196	0	249	75	552	788	1	8	0	186	81	592	1,301	1	7
Ninth district:																				
Chicago, Ill	57	23	151	47	12	1,910	0	197	48	470	1,999	17	4	0	183	141	732	1,989	10	5
Outside district headquarters	2	0	293	158	80	0	0	112	56	428	0	10	0	0	0	0	0	0	0	0
Total, 1924	59	23	444	205	92	1,910	0	309	104	898	1,999	27	4	0	183	141	732	1,989	10	5
Total, 1923	10	3	413	224	50	2,180	1	212	178	883	2,212	0	0	0	147	87	691	2,212	0	13
SUMMARY																				
First district	113	66	41	29	32	1,123	0	223	21	309	166	42	1	------	209	52	694	253	23	3
Second district	666	440	150	74	85	477	8	478	61	710	0	17	1	11	702	109	647	38	10	3
Third district	141	78	182	32	1,326	828	0	295	43	376	0	23	1	3	304	63	726	158	13	4
Fourth district	6	5	35	28	38	231	1	49	28	76	86	3	0	0	36	19	68	108	1	0
Fifth district	90	74	191	145	321	675	1	270	89	338	490	14	0	1	298	89	269	490	10	0
Sixth district	210	128	124	77	40	1,008	4	427	128	618	114	42	6	7	528	83	774	241	45	7
Seventh district	139	116	192	150	25	411	1	244	159	201	163	16	0	2	208	94	180	164	14	0
Eighth district	153	44	247	208	70	1,542	0	210	51	359	485	46	3	0	159	69	742	1,125	29	2
Ninth district	59	23	444	205	92	1,910	0	309	104	898	1,999	27	4	0	183	141	732	1,989	10	5
Grand total, 1924	1,577	974	1,606	948	2,020	8,205	15	2,505	684	3,885	3,503	[2] 230	16	24	2,627	719	4,832	4,566	[3] 155	24
Grand total, 1923	1,124	644	1,308	949	1,526	7,821	7	2,219	905	4,677	4,062	------	25	20	2,124	716	4,568	5,340	------	42

[2] Of this number, 222 were amateur extra first-grade examinations.

[3] Of this number, 147 were amateur extra first-grade licenses.

Selection from

ANNUAL REPORT

OF THE

COMMISSIONER OF NAVIGATION

TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1925

WASHINGTON
GOVERNMENT PRINTING OFFICE
1925

RADIO COMMUNICATION

The use of radio is being constantly extended. Each year brings new development and a dependence to a greater extent upon it for various classes of service. Successful operation and continued growth depends largely upon reasonable regulation which will allow as much freedom as possible in the application of new ideas and give adequate protection to existing services, some of which depend entirely upon radio and involve safety of life and property.

The enforcement of the existing radio laws and the regulation of the services as contemplated therein is performed by the radio inspection service of the bureau, and the demands made upon this service resulting largely from complaints of interference are not receiving the prompt consideration demanded by the public and which we are expected to perform. We should have an enlargement of the inspection force, increased facilities for performing the work, and more extensive travel for the purpose of investigating complaints and improving the service to the public.

TRANSOCEANIC SERVICE

In transoceanic service radio is used to a considerable extent for international communication in competition with the cable service. At present this service extends to Great Britain, France, Italy, Norway, Sweden, Poland, Argentina, Hawaii, Japan, and Germany, and also to the following countries in Central America: Nicaragua, Costa Rica, and Honduras. The income from the transoceanic service of American stations for 1924 amounted to $3,358,584.00, not including the income of the stations communicating with Central America.

POINT-TO-POINT SERVICE

The national point-to-point service is used mostly for private purposes, although one system has been in operation on the Pacific coast for about 10 years which is open for public service in competition with the land wire system. There is also another system in operation in the Hawaiian Islands, where it is used in conjunction with the wire system.

MARINE SERVICE

There were 8,603 inspections made during the year as compared with 7,727 for the previous year. These inspections developed 316 cases of inefficient apparatus or other defects. In the United States there are 41 commercial coast stations working with ships. Of this number 21 are equipped with continuous wave transmitters. There has been a material increase in this marine traffic.

AMATEUR SERVICE

The amateur radio operators were authorized by the department to use the following channels below 100 meters: 85.7 to 75 meters; 42.8 to 37.5 meters; 21.4 to 18.7 meters; 5.35 to 4.69 meters. They have been very successful in effecting daylight transcontinental communication and also have communicated with European amateurs during the daytime by using these short wave lengths. A 40-meter wave length is apparently the one mostly used, although extensive tests have been carried on in all of the new channels.

In addition to the above, the department has also experimentally authorized the use by amateurs of a band of wave lengths 1,000 kilocycles wide from 400,000 kilocycles equaling 0.7496 meters to 401,000 kilocycles equaling 0.7477 meters for the purpose of conducting experiments in beam transmission. Some of the amateurs have become interested in the the transmission of pictures by radio and are conducting experiments along that line.

On June 30, 1925, there were 15,111 licensed amateur stations as compared with 15,545 a year ago.

BROADCASTING SERVICE

The number of class B stations has increased during the year from 54 to 99, and all the wave lengths reserved for this class, as recommended by the Third National Radio Conference, are in use. In most cases there are 2 stations and in a number of cases 3 and 4 stations using the same wave length. Five class B stations are operating on class A wave lengths.

During the year the class A stations increased from 378 to 468. This increase was offset by the reduction in class C stations from 101 to 2. These remaining 2 stations will be transferred to one of the other classes within a short time. There are 2 class D stations the same as last year. On June 30, 1924, we had a total of 535 broadcasting stations. On June 30, 1925, we have 571, an increase of 36. During the past year 245 stations discontinued operation while 281 new stations were licensed. Usually the incoming stations were of higher power than the outgoing ones.

The following table shows a summary of broadcasting activities from June 30, 1922, to June 30, 1925, inclusive:

June 30—	Class A	Class B	Class C	Class D	Total number stations	Power in watts	Average power per station in watts	New stations licensed	Stations discontinued
1922	--------	--------	382	--------	382	57, 100	149. 4	382	--------
1923	203	42	327	1	573	89, 450	156. 1	450	259
1924	378	54	101	2	535	91, 925	190. 5	244	282
1925	468	99	2	2	571	178, 430	312. 4	281	245

INTERNATIONAL BROADCASTING

Since 1923 international broadcasting has been carried on in an experimental way and promises to become a successful and valuable feature of many of our future programs. For this purpose short waves usually have been employed.

On several occasions the programs of American stations were received in foreign countries and rebroadcast by their local stations on their normal wave lengths. One of these programs was successfully repeated by a station at Cape Town, South Africa, and other programs have been received at London, Glasgow, Liverpool, Melbourne, Sydney, Johannesburg, Stuttgart, and several other foreign cities. Two attempts have been made to rebroadcast in this country the programs from London. Undoubtedly this will be one of the broadcasting features next winter. It is expected that the international service will be much improved and extended within a year.

Two or three of the broadcasting stations are arranging to increase their power to a considerable extent. Such increases as contemplated will undoubtedly increase the range of these stations, and the programs of American stations doubtless will be received more satisfactorily in foreign countries within the next year if the increased power can be used in a satisfactory manner.

INSPECTION SERVICE

During the fiscal year 1924 there were 7,727 inspections made of ship stations. In 1925 the number was increased to 8,603. There were 1,339 inspections made of voluntarily equipped ships as compared with 1,577 the previous year.

An extension of the inspection service is essential to properly enforce the laws and to give reasonable attention to the numerous complaints of interference, including the large volume received from broadcast listeners, who are demanding better service. The employment of observers for night duty to check the wave lengths of transmitting stations and note other violations should be undertaken as early as possible. Steps have been taken to supply the field offices with piezo crystals to insure accuracy in frequency or wave length measurements. One of the large electrical companies has been conducting experiments for some time to determine the characteristics and peculiarities inherent in the piezo crystals. One of the interesting and possibly valuable experiments covers the operation of two stations simultaneously on one wave length, having the two stations controlled from one crystal.

INTERCONNECTION

Simultaneous broadcasting of the same program by a large number of stations has been extended considerably during the past year. On one occasion a speech was broadcast through 27 stations extending from the Atlantic to the Pacific coast. The area covered included over 58 per cent of the United States population.

There are two systems of interconnection—one by wire and the other by radio. The wire connection is used more extensively and so far has been more satisfactory, although radio connection has the advantage of making it possible for stations in foreign countries to pick up a program broadcast by a station in the United States and broadcast it locally. It is believed that this feature of broadcasting will be extended to a considerable extent during the next year.

NEW LEGISLATION

Steps may be taken to secure by the next Congress new legislation giving to the department more adequate control over the new services which have been established since the act of August 13, 1912.

In the absence of specific law to cover the rapidly changing radio conditions your annual conferences with those directly concerned with the development of radio and through the cooperation secured at these conferences have made it possible to proceed in a somewhat orderly manner, although it seems essential that we have a better legal foundation which will permit regulations to keep pace with the progress of the science and to extend the present radio organization so as to carry on this work in an efficient manner.

INTERNATIONAL RADIO CONFERENCE

The last International Radiotelegraph Conference was held in London in 1912. The convention drawn at that time covers the marine service only. Since 1912 many new uses of radio have developed, and it is agreed that there should be a revision of the present convention to cover all kinds of international communication and to prevent as far as possible international interference. Plans are being made to hold the next conference in Washington some time during the calendar year 1926.

NATIONAL RADIO CONFERENCES

Three national radio conferences have been held during the last three years, the last one in October, 1924. These conferences have been largely attended by representatives of the many radio interests. They afforded an opportunity for a better understanding between the users of various radio services and resulted in a declared spirit of cooperation which has been of inestimable value to the department in its efforts to serve the great proportion of our people interested in this industry.

INTERNATIONAL RADIO ACCOUNTING SECTION

Under the provisions of the London Radiotelegraph Convention of 1912, to which the United States is signatory, each administration is required to provide for the collection from vessels under its registry of all tolls for radiotelegraph traffic exchanged with stations of other administrations. From April, 1913, to June, 1924, the collection and liquidation of these accounts were carried on by the Navy Department. On July 1, 1924, by authority of the general appropriation act of the Department of Commerce, fiscal year 1925, the personnel and equipment of the international radio accounting unit of the Navy Department, together with all outstanding accounts, were transferred to the Bureau of Navigation, Department of Commerce.

A brief summary of the principal operations of the international radio accounting section for the fiscal year 1925 is as follows:

Accounts received from foreign administrations:	
Accounts transferred from the Navy	918
Accounts received from foreign administrations	866
Total accounts handled	1,784
Accounts settled with foreign administrations	1,104
Accounts remaining on hand June 30, 1925	680

The foregoing accounts were segregated, billed, and forwarded for collection to the various American shipowners or their authorized agents, as follows:

Accounts receivable from American shipowners:	
Transferred from the Navy	5,360
Sent to shipowners	4,956
Total accounts receivable	10,316
Accounts collected from shipowners	6,624
Remaining on hand June 30, 1925	3,692
The fiscal operations were as follows:	
Receipts, including transfer from Navy	$176,125.28
Disbursements to foreign administrations	131,666.77
Balance June 30, 1925	44,458.51

In general, the operations of this section are similar to those of a clearing house. Monthly or quarterly accounts are received from foreign administrations, broken down, and distributed to the various ship-control authorities, from whom the accounts are due, and when each account so received has been collected in full foreign exchange is purchased and forwarded to the administration in whose behalf the collections have been made.

COST OF RADIO SERVICE

The following statement shows the detailed expenditures of the radio service for 1925, and the appropriation and proposed allotment for the fiscal year 1926.

Place of inspection or examination (city or town)	Stations inspected					Amateur stations licensed	Operators examined							Operators licensed						
							Commercial			Amateur				Commercial			Amateur			
	Ship—Voluntary equipment	Ship for license	Land [1]	Land for license [1]	General and restricted amateur		Extra first	First	Second	First	Second	Extra first	Cargo	Extra first	First	Second	First	Second	Extra first	Cargo
First district:																				
Boston, Mass	130	44	38	9	8	999	0	205	23	149	153	2	2	2	180	70	563	292	7	2
Outside district headquarters	15	3	32	42	50		0	0	2	13	0	0	0	0	0	1	12	0	0	0
Total, 1925	145	47	70	53	58	999	0	205	25	162	153	2	2	2	180	71	575	292	7	2
Total, 1924	113	66	41	29	32	1, 123	0	223	21	309	166	37	5	0	209	52	694	253	18	5
Second district:																				
New York, N. Y	217	231	138	102	13	500	2	372	4	426	0	2	3	7	645	67	552	32	1	2
Outside district headquarters	71	65	74	34	25		0	42	0	29	0	1	0	0	0	0	0	0	0	0
Total, 1925	288	296	212	136	38	500	2	414	4	455	0	3	3	7	645	67	552	32	1	2
Total, 1924	666	440	150	74	85	447	8	478	61	710	0	14	3	11	702	109	647	38	7	3
Third district:																				
Baltimore, Md	86	45	31	8	20	793	0	90	19	60	0	4	0	1	213	57	407	105	4	0
Philadelphia, Pa	40	21	46	2	24		0	70	20	72	0	0	0	0	0	0	0	0	0	0
Norfolk, Va	27	20	6	5	57		1	13	2	19	0	0	0	1	36	4	24	0	0	0
Outside district offices	0	0	65	13	614		1	16	2	34	0	1	0	1	8	0	18	0	1	0
Total, 1925	153	86	148	28	715	793	2	189	43	185	0	5	0	3	257	61	449	105	5	0
Total, 1924	141	78	182	32	1, 326	828	0	295	43	376	0	23	0	3	304	63	726	158	13	0
Fourth district:																				
Atlanta, Ga	0	0	1	5	6	277	0	34	9	34	82	4	0	0	44	12	99	109	2	0
Savannah, Ga	1	1	8	1	0		0	18	2	1	0	0	0	0	18	2	1	0	0	0
Outside district offices	7	0	35	8	4		0	27	11	65	0	2	0	0	6	5	14	0	1	0
Total, 1925	8	1	44	14	10	277	0	79	22	100	82	6	0	0	68	19	114	109	3	0
Total, 1924	6	5	35	28	38	231	1	49	28	76	86	2	0	0	36	19	68	108	1	0
Fifth district:																				
New Orleans, La	78	71	22	22	43	672	0	124	21	59	367	0	0	2	264	20	67	367	0	0
Outside district headquarters	21	13	130	86	273		0	84	28	140	2	12	0	0	29	28	114	2	7	0
Total, 1925	99	84	152	108	316	672	0	208	49	199	369	12	0	2	293	48	181	369	7	0
Total, 1924	90	74	191	145	321	675	1	270	89	338	490	14	0	1	298	89	269	490	10	0

Sixth district:																				
San Francisco, Calif	96	71	32	43	4	1,569	2	254	45	190	91	1	0	3	476	77	703	137	3	0
Outside district headquarters	17	7	89	68	32	-------	1	252	101	312	1	2	0	1	57	19	96	1	0	0
Total, 1925	113	78	121	111	36	1,569	3	506	146	502	92	3	0	4	533	96	799	138	3	0
Total, 1924	210	128	124	77	40	1,008	4	427	128	618	114	42	0	7	528	83	774	241	45	0
Seventh district:																				
Seattle, Wash	69	44	128	92	11	490	0	158	93	138	65	4	1	0	186	70	226	119	1	1
Outside district headquarters	0	1	26	17	2	-------	0	26	16	21	0	0	0	0	0	0	0	0	0	0
Total, 1925	69	45	154	109	13	490	0	184	109	159	65	4	1	0	186	70	226	119	1	1
Total, 1924	139	116	192	150	25	411	1	244	159	201	163	16	0	2	208	94	180	164	14	0
Eighth district:																				
Detroit, Mich	144	32	64	33	18	1,832	1	104	18	76	422	1	0	1	146	51	419	1,030	2	0
Outside district headquarters	38	28	295	182	96	-------	0	111	26	307	0	6	0	0	23	36	178	0	2	0
Total, 1925	182	60	359	215	114	1,832	1	215	44	383	422	7	0	1	169	87	597	1,030	4	0
Total, 1924	153	44	247	208	70	1,542	0	210	51	359	485	46	0	0	159	69	742	1,125	29	0
Ninth district:																				
Chicago, Ill	278	24	356	69	6	2,942	0	243	96	634	1,783	2	0	0	195	151	807	1,766	2	0
Outside district headquarters	4	1	492	331	53	-------	0	103	51	328	0	5	0	0	0	0	0	0	0	0
Total, 1925	282	25	848	400	59	2,942	0	346	147	962	1,783	7	0	0	195	151	807	1,766	2	0
Total, 1924	59	23	444	205	92	1,910	0	300	104	898	1,999	27	0	0	183	141	732	1,989	10	0
SUMMARY																				
First district	145	47	70	53	58	990	0	205	25	162	153	2	2	2	180	71	575	292	7	2
Second district	288	296	212	136	38	500	2	414	4	455	0	3	3	7	645	67	552	32	1	2
Third district	153	86	148	28	715	793	2	189	43	185	0	5	0	3	257	61	449	105	5	0
Fourth district	8	1	44	14	10	277	0	79	22	100	82	6	0	0	68	19	114	109	3	0
Fifth district	99	84	152	108	316	672	0	208	49	199	369	12	0	2	293	48	181	369	7	0
Sixth district	113	78	121	111	36	1,569	3	506	146	502	92	3	0	4	533	96	799	138	3	0
Seventh district	69	45	154	109	13	490	0	184	109	159	65	4	1	0	186	70	226	119	1	1
Eighth district	182	60	359	215	114	1,832	1	215	44	383	422	7	0	1	169	87	597	1,030	4	0
Ninth district	282	25	848	400	59	2,942	0	346	147	962	1,783	7	0	0	195	151	807	1,766	2	0
Grand total, 1925	1,339	722	2,108	1,174	1,359	10,074	8	2,346	589	3,107	2,966	49	6	19	2,526	670	4,300	3,960	33	5
Grand total, 1924	1,577	974	1,606	948	2,029	8,205	15	2,505	684	3,885	3,503	222	8	24	2,627	719	4,832	4,566	147	8

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[1] Coast, inland, and special land stations.

Selection from

ANNUAL REPORT

OF THE

COMMISSIONER OF NAVIGATION

TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1926

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

WASHINGTON
GOVERNMENT PRINTING OFFICE
1926

RADIO COMMUNICATION

INTERNATIONAL TELEGRAPH CONFERENCE

The International Telegraph Conference was held in Paris in the latter part of 1925. Representatives of this Government attended the conference and had opportunity to discuss our plans for the forthcoming International Radiotelegraph Conference with the delegations of other countries. Several countries had submitted proposals relating specifically to radio communication which our Government considered proper subjects for consideration at the International Radiotelegraph Conference to be held in Washington in 1927. The views of our Government received sympathetic support, thereby postponing consideration of the radio proposals.

It was agreed at the Paris conference that, following the Washington conference, there should be held another conference having as its purpose the amalgamation of the telegraph and radiotelegraph conventions. Our Government is a party to the radiotelegraph convention but has not become a party to the telegraph convention.

INTERNATIONAL RADIOTELEGRAPH CONFERENCE

For several months a committee representing the directly concerned departments of the Government have been studying our radio problems and preparing proposals for consideration at the International Radiotelegraph Conference which it is contemplated will be held in Washington some time during 1927.

Our proposals have been arranged in three parts: Part 1, the convention; part 2, the convention regulations; part 3, the management regulations. In the United States radio public service is conducted almost entirely by commercial or private concerns. The Government exercises only limited control over the operation of their stations. Under such limited regulation of service it has been possible for our companies to operate their radio stations efficiently and economically.

In view of our extensive experience under the existing system the proposal is made that there be included in the convention proper and the regulations supplemental thereto only those subjects which concern sovereign governments as governments, and not as communication agencies. Under this arrangement there is left for inclusion in the management regulations subjects relating to economic and technical principles, methods of operation, plant and traffic rules, tariffs, traffic classification and procedure and kindred details of office management. The proposed plan will present an opportunity for managements represented at the next radiotelegraph conference to prepare and agree to a uniform international contract covering management problems with which they are directly concerned.

FOURTH NATIONAL RADIO CONFERENCE

The Fourth National Radio Conference was held November 9 to 11, 1925. There was a larger attendance than at either of the three previous conferences. Recommendations made at former conferences were reiterated. Continued cooperation with the department and between interests was the outstanding example of the beneficial effect of these annual meetings. While self-regulation has made it possible to harmonize differences and secure orderly conduct of business, it was deemed advisable to recommend new radio legislation.

It was also recommended that the number of broadcasting stations be limited, and that no new stations be licensed until it would be in the interest of public service to add new stations. The department has endeavored to safeguard public interest and put into effect as far as practical all of the recommendations of the conference.

TRANSOCEANIC SERVICE

Direct commercial radio service is maintained between the United States and the following countries: Great Britain, France, Germany, Norway, Poland, Italy, Sweden, Argentina, Brazil, Holland, Japan, Hawaii.

CENTRAL AMERICAN SERVICE

Commercial radio service is maintained between the United States and the following points: Cartagena, Bogota, and Santa Marta, Colombia; Almirante, Panama; Limon and Cartago, Costa Rica; Managua, Bluefields, and Cape Gracias, Nicaragua; Puerta Castilla, Tila, and Tegucigalpa, Honduras; Puerto Barrios, Guatemala; and Swan Island, Caribbean Sea.

TRANSOCEANIC RADIO PICTURES

Commercial pictoradiogram services are now in operation between New York and London and San Francisco and Hawaii. By means of this development photographs, pictures, advertisements, legal documents, bank checks, cartoons, fingerprints, and similar pictorial or printed matter are quickly transmitted and reproduced. This new field may develop into an important branch of radio communication.

TRANSOCEANIC RADIOTELEPHONE SERVICE

It is anticipated that radiotelephone service between the United States and Great Britain will be available for commercial use next winter. Tests which have been conducted have shown encouraging results. The difference in time in connection with office hours, of banks, stock exchange, and brokerage houses may present some difficulty.

BROADCASTING SERVICE

There has been a small decrease in the number of broadcasting stations. We have 528 licensed stations as compared with 571 last year and 535 the previous year. There has been a material increase in power used. The average power per station in watts is 715.8 as compared with 312.4 last year and 190.5 the year before. During the past year 117 new stations were licensed and 160 discontinued. The previous year 281 new stations were licensed and 245 discontinued.

According to the most dependable information we have been able to obtain there are 349 broadcasting stations operating in foreign countries as compared with 528 such stations in the United States. These stations are distributed as follows: Canada, 47; Sweden, 22; France, Germany, and Spain each, 21; United Kingdom, 20; Russia and Australia each, 18; Cuba and Mexico each, 17; Brazil, 12; Argentina and New Zealand each, 10. There are from 1 to 9 stations each in 49 other countries.

A prominent radio publication furnishes some interesting figures on the radio situation. It estimates there are 5,000,000 homes equipped with radio and 21,800,000 without radio. Their estimates further show the growth of yearly radio sales from 1922 to 1925, inclusively. The figures are as follows: 1922, $60,000,000; 1923, $120,000,000; 1924, $350,000,000; and 1925, $450,000,000.

Under operating conditions such as we have had for the past few years there seems to be every reason to anticipate continued growth in the use of radio, improved service to the public, and much greater satisfaction, but in the absence of adequate radio laws and careful regulation it is difficult at this time to forecast what the actual conditions may be during the coming winter.

MARINE SERVICE

During the fiscal year there was a small increase in the number of American merchant vessels equipped with radio. At the close of this fiscal year we have 1,954 vessels equipped as compared with 1,901 the previous year.

Considerable progress has been made during the year in converting spark transmitters on ships to the more modern type—tube transmitters, which increase the range of the station and produce much less interference. It is not unusual for ships equipped with continuous-wave apparatus, tube or arc, to maintain daily communication with land on a trans-Atlantic voyage.

The value of the radiocompass as an aid to navigation and for the purpose of locating vessels in distress is recognized by steamship companies. There have been a number of reports of the usefulness of this equipment. Probably the most noteworthy cases are the rescue of the crews of the Italian vessel *Ignazio Florio* and the British steamship *Antinoe*. In the case of the steamship *Ignazio Florio* the chief radio operator on the American steamship *President Harding* stated:

> It is my opinion, and also that of the captain, that without the radiocompass it would have been practically impossible to have found the *Ignazio Florio* except after hours of aimless cruising.

In the rescue of the crew of the British freighter *Antinoe* by the American steamship *President Roosevelt* the following pertinent statements were reported as having been made by the captain of the steamship *President Roosevelt:*

> Five-forty a. m. of the 24th received SOS from steamship *Antinoe*. Proceeded to her position by radiocompass bearings, which proved her position 100 miles in error. But for the radiocompass the *Roosevelt* might have looked fruitlessly for hours in the mountainous seas and very possibly never would have located the *Antinoe* while she still floated.

At the close of the fiscal year 1925 there were 83 American vessels equipped with radiocompasses. There are now 230 such installations on American merchant vessels.

RADIO-INSPECTION SERVICE

Thirty-four employees are engaged in radio-inspection work in the field, which embraces the United States, Alaska, Hawaii, and Porto Rico. During the fiscal year just ended there were 9,197 inspections made of the radio installations on American and foreign vessels clearing from our ports, as compared with 8,603 the previous year. These inspections developed 325 cases of defective apparatus, lack of proper equipment or personnel, or other causes which would have constituted violations of the law had the vessels sailed without proper inspection. Due to our constant and careful inspection the radio equipment on vessels sailing from our ports is kept in a high degree of efficiency, thus properly safeguarding life and property as contemplated by the ship radio act. Inspection trips were made to 548 cities for the purpose of inspecting stations, examining operators, and performing other work required by the act to regulate radio communication. During the year it was necessary to make repeated trips to many of these cities, the total number of such trips being 1,235. Inspections were made of 1,088 land stations for license. Examinations were given to 3,144 applicants for commercial operators' licenses and 5,456 applicants for amateur operators' licenses.

In connection with this activity the radio test car used in the Detroit district enabled us to perform our work in a much more satisfactory and efficient manner and at a considerable saving in expense.

Considerable advance has been made in the development of more precise and efficient measuring instruments, notably the field strength measuring apparatus, frequency measuring apparatus, and quartz crystal oscillators. The use of this apparatus should insure more satisfactory service to the public and reduce materially our interference problems.

AMATEUR SERVICE

There was a considerable decrease in the number of amateur radio station licenses issued for this year as compared with the previous year. In 1925 we licensed 10,074 amateur stations, and in 1926 there were 8,037 licensed. As these licenses are issued for a period of two years, these figures show a total of 18,111. However, during the year 3,209 were discontinued, which leaves 14,902 active stations, a substantial reserve force to draw from in any emergency. Reports indicate the amateurs are taking advantage of all improvements made in the art and are inclined to more readily adopt new ideas than is possible with the larger stations, where much experimenting must be done before changes are made which involve large expenditures of time and money. Practically all amateurs are now using continuous-wave transmitters, many of them having crystal control. With the amateurs the spark set is considered obsolete, as is the crystal receiving set.

NEW LEGISLATION

Congress adjourned without enacting any new radio legislation. The House passed the White bill, and the day before adjournment the Senate passed the White bill materially amended. There was not sufficient time for the conferees to adjust the differences between the two bills. It is expected that a compromise bill will be enacted into law early in the next session which will provide the control which should be had over a service of such great importance to the public and which is employed so extensively for various useful purposes.

INTERNATIONAL RADIO ACCOUNTING SECTION

Under the provisions of the London Radiotelegraph Convention of 1912, to which the United States is signatory, each administration is required to provide for the collection from vessels under its registry of all tolls for radiotelegraph traffic exchanged with stations of other administrations.

The following summary covers the principal operations of this section for the fiscal year 1926:

Accounts received from foreign administrations:	
Accounts on hand July 1, 1925	680
Accounts received fiscal year 1926	1, 005
Total	1, 685
Accounts cleared during year 1926	1, 041
Accounts remaining on hand June 30, 1926	644

Each of the foregoing accounts represents periods varying from one to six months; that is to say, some foreign administrations submit their accounts on a monthly basis, while others submit separate accounts varying from one to six months for each account.

During the year accounts were received from 110 foreign administrations or foreign companies operating coastal services. These accounts in each case included not only the amounts due such foreign administrations or companies but the amounts due and payable to vessels of American registry for ship-receiving charges.

The following summary shows briefly the fiscal operation for the year under report:

Balance on hand July 1, 1925	$44, 458. 51
Amount collected from American companies	101, 770. 73
Total	146, 229. 24
Disbursements to foreign administrations and companies	102, 014. 77
Balance June 30, 1926	44, 214. 47

In the previous annual report it was stated that the operations of this section were those of a clearing house, and since the data given in the foregoing paragraphs cover the net operations only, the following additional data will serve to illustrate more clearly the actual operations of the section:

Gross amount cleared with foreign administrations during the year gold francs	760, 537. 92	($146, 751. 12)
Amount collected from foreign administrations for American commercial companies gold francs	231, 846. 19	(44, 736. 35)
Net settlements to foreign administrations gold francs	528, 691. 73	(102, 014. 77)

All accounts from foreign administrations or companies, with the exception of those received from Canada, Mexico, and Cuba, are stated in gold francs. It is therefore necessary to convert these accounts into United States currency before submission to American companies for collection and, after collections in full have been effected, a subsequent conversion is necessary into the currency of the country to which payment is made. Since payment is at the election of the creditor country, foreign exchange is purchased either in United States currency for payment abroad or in the currency of the creditor country, depending entirely upon the stability of such foreign currency.

As compared with the net due foreign administrations on July 1, 1924, when the amount was $127,404.02, the net amount due on July 1, 1926, has been reduced to $61,495.63. In accounts receivable from American commercial companies for foreign administrations the amount on July 1, 1924, was $48,409.79, compared with which but $17,281.16 was due from those companies on July 1, 1926.

COST OF RADIO SERVICE

The following statement shows the detailed expenditures of the radio service for 1926 and the appropriation and proposed allotment for the fiscal year 1927:

	1927	1926		1927	1926
Total salaries:			General expenses—Con.		
Field	$212, 760. 00	$149, 150. 45	Transportation of things	$800. 00	$191. 26
Bureau	44, 640. 00	42, 399. 36	Rent	2, 700. 00	2, 015. 07
Total	257, 400. 00	191, 549. 81	Repairs	4, 700. 00	428. 85
			Other services	100. 00	46. 44
			Furniture	850. 00	1, 016. 67
General expenses:			Motor vehicles	8, 360. 00	
Stationery and office supplies	2, 800. 00	544. 46	Office machines and devices	1, 300. 00	959. 18
Scientific and educational supplies	300. 00	163. 60	Scientific instruments and accessories	11, 140. 00	1, 893. 61
Other supplies	400. 00	938. 46	Other equipment	150. 00	544. 76
Telegrams	700. 00	81. 05	Unexpended		22. 08
Telephone	1, 800. 00	1, 819. 48			
Postal service	300. 00	15. 95	Total	77, 600. 00	28, 975. 19
Travel	34, 200. 00	17, 621. 57			
Fuel and oil	5, 500. 00	435. 54	Grand total	335, 000. 00	220, 525. 00
Storage of motor cars	1, 500. 00	237. 16			

SCOPE OF WORK

The following table shows the inspection and licensing work performed yearly from 1914 to 1926, inclusive, and the number of persons employed in the field force:

June 30—	American ships equipped	American ships licensed	Inspections of American and foreign ships	Commercial operators licensed	Commercial and special land stations licensed	Amateur stations licensed	Amateur operators licensed	Total field force
1914	555	203	6, 484	339	83	2, 137	1, 172	20
1915	585	362	6, 152	1, 653	115	3, 547	3, 067	26
1916	604	444	7, 236	1, 278	182	4, 942	4, 199	28
1917	836	484	7, 137	1, 682	160	3, 741	3, 303	28
1918	1, 478	392	5, 575	1, 616				29
1919	2, 312	976	5, 160	1, 645				27
1920	2, 808	1, 158	5, 419	4, 652	254	5, 719	6, 103	25–45
1921	2, 978	921	5, 591	2, 722	491	7, 351	6, 207	26
1922	2, 773	1, 174	6, 971	3, 136	1, 086	9, 525	8, 920	35
1923	2, 723	945	6, 933	2, 860	1, 375	7, 821	9, 908	53
1924	2, 741	1, 382	7, 727	3, 370	1, 489	8, 205	9, 545	53
1925	1, 901	976	8, 603	3, 215	1, 129	10, 074	8, 293	62
1926	1, 954	1, 258	9, 197	3, 398	1, 072	8, 037	8, 140	65

OPERATORS LICENSED

The following table shows the number of radio operators licensed during the past two years:

Class and grade	1925	1926	Total
Commercial extra first class	19	21	40
Commercial first class	2, 526	2, 753	5, 279
Commercial second class	670	616	1, 286
Commercial grade 4	3	8	11
Experiment and instruction	15	11	26
Cargo	5	4	9
Amateur extra first grade	33	112	145
Amateur first grade	4, 300	4, 509	8, 809
Amateur second grade	3, 960	3, 519	7, 479
Total	11, 531	11, 553	23, 084

DETAILED WORK OF THE RADIO SERVICE

The following statement shows the details of the work performed during the past fiscal year compared with 1925 and the total number of licensed and Government radio stations:

Work of service	1925	1926
Clearances of American and foreign vessels required by law to be equipped with radio	12, 141	13, 009
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	8. 603	9, 197
Inspections of radio equipment on voluntarily equipped vessels	1, 339	1, 583
American ship radio stations licensed	976	1, 258
American ship radio stations inspected for license	722	1, 048
Land stations inspected for license	1, 174	1, 088
Amateur stations licensed	10, 074	8, 037
Commercial operators examined	2, 946	3, 144
Commercial operators licensed	3, 218	3, 398
Amateur operators examined	6, 122	5, 456
Amateur operators licensed	8, 293	8, 140
Defects found upon inspection of ship radio stations where clearance would have been in violation of the law	316	332
Licensed and Government radio stations:		
American vessels equipped with radio	1, 901	1, 954
Special land stations	272	225
Commercial land stations	286	319
Limited commercial (broadcasting) stations	571	528
Amateur stations	15, 111	14, 902
Government land stations	305	325
Government ship stations	1, 218	1, 155

The following table shows a summary of broadcasting activities from June 30, 1922, to June 30, 1926, inclusive:

June 30—	Class A	Class B	Class C	Class D	Total number stations	Power in watts	Average power per station in watts	New stations licensed	Stations discontinued
1922			382		382	57, 100	149. 4	382	
1923	203	42	327	1	573	89, 450	156. 1	450	259
1924	378	54	101	2	535	91, 925	190. 5	244	282
1925	468	99	2	2	571	178, 430	312. 4	281	245
1926	390	136		2	528	377, 950	715. 8	117	160

The following table shows the number of stations licensed to operate on the power indicated:

Power in watts	Number of stations	Power in watts	Number of stations	Power in watts	Number of stations
5	4	100	115	1,500	5
10	49	150	3	2,000	2
15	7	200	3	3,500	3
20	9	250	29	4,000	2
25	1	500	139	5,000	16
30	1	750	9	20,000	[1]1
50	81	1,000	47	50,000	[1]2

[1] These three stations operate experimentally with variable power to a maximum as indicated.

Following is the usual statement, by districts, of the work performed in the districts during the past fiscal year compared with the work performed during the previous year:

Place of inspection or examination (city or town)	Stations inspected					Amateur stations licensed	Operators examined							Operators licensed						
							Commercial			Amateur				Commercial			Amateur			
	Ship—Voluntary equipment	Ship for license	Land [1]	Land for license [1]	General and restricted amateur		Extra, first	First	Second	First	Second	Extra, first	Cargo	Extra, first	First	Second	First	Second	Extra, first	Cargo
First district:																				
Boston, Mass	34	22	16	7	4	836	......	230	13	142	109	1	......	......	202	49	677	287	15	......
Outside district headquarters	8	7	73	14	79	......	......	......	......	65	......	......	......	......	......	......	35	......	......	......
Total, 1926	42	29	89	21	83	836	......	230	13	207	109	1	......	......	202	49	712	287	15	......
Total, 1925	145	47	70	53	58	999	......	205	25	162	153	2	2	2	180	71	575	292	7	2
Second district:																				
New York, N. Y	347	355	114	70	11	657	6	475	76	464	40	1	5	12	696	67	599	42	5	4
Outside district headquarters	154	146	80	49	18	......	......	39	6	36	......	......	......	......	......	......	......	......	......	......
Total, 1926	501	501	194	119	29	657	6	514	82	500	40	1	5	12	696	67	599	42	5	4
Total, 1925	288	296	212	136	38	500	2	414	4	455	......	3	3	7	645	67	552	32	1	2
Third district:																				
Baltimore, Md	97	47	23	6	4	688	......	109	13	28	71	......	......	......	202	36	471	71	15	......
Philadelphia, Pa	71	38	67	5	14	......	......	84	13	75	......	......	......	......	34	2	4	......	......	......
Norfolk, Va	41	36	32	6	26	......	......	26	9	9	......	......	......	......	38	9	12	......	......	......
Outside district offices	......	......	29	8	81	......	......	13	4	17	......	......	......	1	29	2	44	......	1	......
Total, 1926	209	121	151	25	125	688	......	232	39	129	71	......	......	1	303	49	531	71	16	......
Total, 1925	153	86	148	28	715	793	2	189	43	185	......	5	......	3	257	61	449	105	5	......
Fourth district:																				
Atlanta, Ga	......	......	9	2	......	232	......	14	8	17	117	......	......	......	46	18	69	138	5	......
Savannah, Ga	2	4	6	5	......	......	......	15	1	3	......	......	......	......	13	1	4	......	......	......
Outside district offices	5	3	58	19	......	......	......	17	11	39	......	2	......	......	......	......	2	......	......	......
Total, 1926	7	7	73	26	......	232	......	46	20	59	117	2	......	......	59	19	75	138	5	......
Total, 1925	8	1	44	14	10	277	......	79	22	100	82	6	......	......	68	19	114	109	3	......

Fifth district:																				
New Orleans, La	94	70	32	24	17	498	-----	128	12	44	339	-----	-----	1	286	25	61	313	3	-----
Outside district headquarters	43	34	160	127	280	-----	-----	119	21	146	-----	7	-----	-----	32	30	98	-----	5	-----
Total, 1926	137	104	192	151	297	498	-----	247	33	190	339	7	-----	1	318	55	159	313	8	-----
Total, 1925	99	84	152	108	316	672	-----	208	49	199	369	12	-----	2	293	48	181	369	7	-----
Sixth district:																				
San Francisco, Calif	151	129	44	23	8	1, 156	1	390	34	141	92	3	-----	6	575	87	788	159	30	-----
Outside district headquarters	4	-----	181	88	25	-----	-----	132	53	237	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total, 1926	155	129	225	111	33	1, 156	1	522	87	378	92	3	-----	6	575	87	788	159	30	-----
Total, 1925	113	78	121	111	36	1, 569	3	506	146	502	92	3	-----	4	533	96	799	138	3	-----
Seventh district:																				
Seattle, Wash	222	85	41	23	-----	383	-----	150	42	48	77	-----	-----	-----	236	65	198	119	3	-----
Outside district headquarters	9	2	115	78	9	-----	-----	75	44	76	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total, 1926	231	87	156	101	9	383	-----	225	86	124	77	-----	-----	-----	236	65	198	119	3	-----
Total, 1925	69	45	154	109	13	490	-----	184	109	159	65	4	1	-----	186	70	226	119	1	1
Eighth district:																				
Detroit, Mich	39	26	56	37	-----	1, 634	1	103	7	76	393	1	-----	1	156	63	683	940	25	-----
Outside district beaquarters	17	17	140	131	71	-----	-----	67	28	231	-----	4	-----	-----	-----	-----	-----	-----	-----	-----
Total, 1926	56	43	196	168	71	1, 634	1	170	35	307	393	5	-----	1	156	63	683	940	25	-----
Total, 1925	182	60	359	215	114	1, 832	1	215	44	383	422	7	-----	1	169	87	597	1, 030	4	-----
Ninth district:																				
Chicago, Ill	229	22	603	63	5	1, 953	-----	255	135	586	1, 458	5	-----	-----	208	162	764	1, 450	5	-----
Outside district headquarters	16	5	468	303	113	-----	-----	94	63	256	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Total, 1926	245	27	1, 071	366	118	1, 953	-----	349	198	842	1, 458	5	-----	-----	208	162	764	1, 450	5	-----
Total, 1925	282	25	848	400	59	2, 942	-----	346	147	962	1, 783	7	-----	-----	195	151	807	1, 766	2	-----
SUMMARY																				
First district	42	29	89	21	83	836	-----	230	13	207	109	1	-----	-----	202	49	712	287	15	-----
Second district	501	501	194	119	29	657	6	514	82	500	40	1	5	12	696	67	599	42	5	4
Third district	209	121	151	25	125	688	-----	232	39	129	71	-----	-----	1	303	49	531	71	16	-----
Fourth district	7	7	73	26	-----	232	-----	46	20	59	117	2	-----	-----	59	19	75	138	5	-----
Fifth district	137	104	192	151	297	498	-----	247	33	190	339	7	-----	1	318	55	159	313	8	-----
Sixth district	155	129	225	111	33	1, 156	1	522	87	378	92	3	-----	6	575	87	788	159	30	-----
Seventh district	231	87	156	101	9	383	-----	225	86	124	77	-----	-----	-----	236	65	198	119	3	-----
Eighth district	56	43	196	168	71	1, 634	1	170	35	307	393	5	-----	1	156	63	683	940	25	-----
Ninth district	245	27	1, 071	366	118	1, 953	-----	349	198	842	1, 458	5	-----	-----	208	162	764	1, 450	5	-----
Grand total, 1926	1, 583	1, 048	2, 347	1, 088	765	8, 037	8	2, 535	593	2, 736	2, 696	24	5	21	2, 753	616	4, 509	3, 519	112	4
Grand total, 1925	1, 339	722	2, 108	1, 174	1, 359	10, 074	8	2, 346	589	3, 107	2, 966	49	6	19	2, 526	670	4, 300	3, 960	33	5

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[1] Coast, inland, and special land stations.

ANNUAL REPORT OF THE CHIEF OF RADIO DIVISION TO THE SECRETARY OF COMMERCE

1927-1932

Selection from

ANNUAL REPORT

OF THE

CHIEF OF RADIO DIVISION

TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1927

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

UNITED STATES
GOVERNMENT PRINTING OFFICE
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1927

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RADIO DIVISION

Department of Commerce,
Radio Division,
Washington, July 1, 1927.

Hon. Herbert Hoover,
Secretary of Commerce.

Dear Mr. Secretary: In response to your request I furnish the following condensed report of the work of the radio division during the past year, including references to related developments which have taken place during the year.

Because of the rapid advances in the field of broadcasting several efforts have been made during the past few years to obtain new legislation providing adequate control.

Congress passed the original law entitled "An act to regulate radio communication" in 1912. No difficulty arose in connection with the enforcement of this act until the advent of broadcasting. When Congress passed this law radio broadcasting was unknown, consequently no special provision for the control of broadcasting was embodied in the act. For a time orderly operation was made possible by calling together the interested parties and getting them into agreement on the basis of self-regulation. Finally an adverse court decision indicated the advisability of obtaining an opinion of the Attorney General with reference to the authority conferred upon the Secretary by this act. The Attorney General rendered an opinion under date of July 8, 1926, to the effect that the Secretary of Commerce was without authority, under existing law, to assign wave lengths, limit the power, or fix the hours of operation of radio stations. The Attorney General held, moreover, that the Secretary was without authority to refuse a license for the operation of a radio station. This brought about a chaotic situation. All applicants were granted licenses under which they made use of such wave lengths and power and at such times as they saw fit. It became evident that confusion would continue and grow worse unless remedied by legislation. Congress, therefore, passed the radio act of 1927, repealing the act of 1912. Under the new law, which became effective February 23, 1927, a Federal Radio Commission of five members was created. The commission has full authority to license stations for one year. It determines to whom licenses shall be granted and fixes wave lengths, power, and hours of operation. The general powers of the commission are transferred to the Secretary of Commerce from and after one year after its first meeting, which was held on March 15, 1927, the commission retaining authority over certain controversial matters which may be referred to it.

CREATION OF THE RADIO DIVISION

Enforcement of the radio laws has been under the jurisdiction of the Bureau of Navigation since July 1, 1911, when the act requiring apparatus and operators for radio communication on ocean steamers became effective. The extension of the use of radio to general communication purposes, broadcasting, transmission of photographs, etc., made it inadvisable to continue the work in a bureau whose primary concern was the enforcement of laws relating to shipping. It was accordingly decided to separate the radio service from the Bureau of Navigation, effective February 26, 1927.

RADIO INSPECTION SERVICE

During the fiscal year just ended, 9,330 inspections were made of the radio installations on American and foreign vessels clearing from our ports, as compared with 9,197 the previous year. These inspections developed 285 cases of defective apparatus, lack of proper equipment or personnel, or other causes which would have constituted violations of the law had the vessels sailed without inspection. Examinations were given to 3,328 applicants for commercial operators' licenses and 5,597 applicants for amateur operators' licenses. There was a decrease in the number of inspection trips made and the number of land stations inspected due to the lack of control which developed as a result of the previously mentioned Attorney General's opinion. Since the new law became effective our activity has been resumed, with increased demands made upon this division for inspections, observations, monitoring, and special investigations. Many such services are required by the Federal Radio Commission. The radio division is performing all of the field work for the commission, but finds it difficult satisfactorily to meet the demands made upon it even to a limited degree. An enlarged personnel and better equipment are essential for the proper performance of this work.

RADIO TEST CARS

With the rapid progress in radio communication the necessary testing apparatus increased to such an extent that it was no longer possible for an inspector to carry all of the delicate measuring equipment required to make the inspections prescribed by law. To solve the problem, an automobile chassis was selected upon which was mounted a special body capable of housing complete inspection apparatus. On October 7, 1925, the first radio test car was placed in active operation in the field. On this car was permanently mounted a complete radio direction finder, to take bearings on unlicensed transmitting stations, and several sensitive radio receivers by the use of which it was possible to measure the frequency on which transmitting stations were operating. A radio field intensity set was installed in the car, and with this piece of apparatus it was possible to determine the external effect produced by a radio transmitting station in the area in which it was located. Equipped in this manner, the first radio test car operated by the Department of Commerce went into commission in a form which has been found so thoroughly practical that very few changes would be necessary in new cars of this type. It was found that considerable economy in transportation and subsistence in the field could be effected by the use of radio test cars.

The operation of the first test car indicated the advisability of procuring additional cars in order to cover more territory and perform duties not possible of accomplishment in any other manner.

Improvements in the interior arrangement of the cars and the apparatus mounted therein were embodied in the specifications drawn for the three new test cars in February of this year. One of the principal improvements in the apparatus was the incorporation of a number of the individual pieces of equipment for the measurement of frequencies or field strength into one compact unit. With this piece of equipment it is possible to determine the field strength of transmitting stations at distant points operating on wave lengths from 50 to 600 meters and with the same apparatus it is also possible accurately to check the frequencies of transmitting stations operating on wave lengths from 50 to 1,250 meters. It is contemplated that in the near future apparatus will be developed for properly measuring frequencies below 50 meters, which is considered essential, in addition to the present equipment of these cars. The use of the lower wave lengths or higher frequencies is rapidly becoming more general.

In addition to the measurement of frequencies and field strength indicated above, space is provided for the examination of applicants for radio operator's licenses. Each radio test car is in reality a portable laboratory and inspection office.

The three new test cars referred to above, fully equipped, will be placed in active operation in the early fall of this year.

FIELD STRENGTH MEASUREMENT

At the Third National Radio Conference the Secretary of Commerce suggested an investigation on the effect on radio reception produced by broadcasting stations of different power to find out why reception was better in one direction and poorer in another and why some stations of equal power did not serve equal areas.

Since this time the supervisor of radio at Detroit has been experimenting with methods of making these measurements. The results of six investigations made by the supervisor are contained in the March issue of the Radio Service Bulletin.

It has always been the practice to rate radio transmitting stations in terms of power supplied to the antenna. Such a method does not indicate what the effect produced on a distant radio receiver will be. Stations of equal power do not produce signals of equal intensity over the same area. It has been proven that this is due to absorption of the radio energy by steel buildings, electrical networks, or other large metallic bodies.

These stations may be made to serve equal areas if the method of measuring their power is changed. The power has always been measured in the amount of watts or kilowatts in the antenna. A suggested method of measuring power is in microvolts per meter at certain distances from the transmitter.

From the data gathered on a field-strength study of a station it is possible to make a map showing the exact area covered. On this map can be shown the strength of the radio field in microvolts at varying distances from the transmitter. With such a system of measurement any change of power in a station could be determined anywhere in the area served.

FREQUENCY STABILITY

The necessity for maintaining frequency stability is becoming more and more important because of the increasing number of high-range stations. The demands made upon our service to insure the required accuracy necessitates the use of the most modern and precise measuring apparatus available. Our apparatus must be as accurate and dependable as the best used by commercial interests. Public confidence must be maintained in the accuracy of the measurements made by the radio inspection force. Our instruments and methods must be accepted as standard.

RADIO COMPASS

The value of a radio compass as an aid to navigation is indicated by the increased installations. There are now 541 American vessels equipped with radio compasses. Last year there were 230. A good percentage of these installations are on vessels on the Great Lakes.

TUBE TRANSMITTERS

There is a continued growth in the use of tube transmitters. Most of the larger vessels which enter our ports make use of this type of equipment, with the advantage of long-range communication and reduction of interference. Most of the stations on land make use of tube or arc transmitters. Spark transmitters are used principally in Alaska. All of the transoceanic services utilize continuous-wave transmitters.

PHOTOGRAPHS BY RADIO

The sending of photographs by radio has been in course of development for several years. A service making use of one of the systems provides for the transmission of weather maps from the United States Weather Bureau to vessels at sea, where they are recorded with pen and ink on base maps. Another service referred to commercially as "Photoradio" was opened to the public on a commercial-rate basis on May 1, 1926. An important extension of this service which promises to be of public interest and benefit is in the nature of facsimile reproductions, whereby a radio message handed in at the transmission station is exactly reproduced at the receiving station and so delivered to the addressee. With this system it is possible to transmit messages written in hieroglyphics, shorthand notes, fingerprints, etc.

TELEVISION

"Television" is a name given to a new system which is old in some of its principles. So far it is considered experimental in its association with radio. Several successful demonstrations of its use have been given. One of these demonstrations, which took place on April 7, 1927, required the use of three transmitters, one being of 50 kilowatts power employed to transmit the speech of the person talking, one of 5 kilowatts power used for the transmission of the picture of the person talking, and the third of 1 kilowatt power to generate a current for the purpose of synchronizing the frequency of the picture and voice transmitters. This arrangement made possible the reception of voice and picture simultaneously.

AMATEUR SERVICE

During the past fiscal year the number of amateur transmitting stations increased from 14,902 to 16,926. Much credit is due to the amateurs for their contribution to the development of short-wave transmission. Nearly all of the amateur stations are now operating on wave lengths of 80 meters and below.

It seems appropriate to mention briefly here some of the more important public services rendered by amateur stations during the past year. Immediately following the Florida hurricane many amateur stations in Georgia, Florida, Alabama, Mississippi, and Louisiana provided the only means of communication with the stricken sections. They handled important and urgent messages between the State and municipal authorities, messages for the Red Cross consisting of requests for food, medical supplies, and doctors. Much of the same service was performed during the Mississippi flood. For the past three years the American Radio Relay League, through the American Railway Association, has placed its stations and facilities at the disposal of railroads for use as a means of emergency communication should their regular wire system be interrupted. Actual use of this emergency service has been made several times during the past year.

INTERNATIONAL RADIOTELEPHONE SERVICE

Radiotelephone service between New York and London was made available to the public January 7, 1927. At present anyone in the United States and Cuba can talk with England, Scotland, and Wales. The radio transmitter on this side is at Rocky Point, Long Island, N. Y.; the receiving station at Houlton, Me. On the other side the transmitter is at Rugby, England, and the present receiving station is at Cupar, Scotland. When the service was established the receiver was at Wroughton, England. While the service is understood to be available 24 hours a day, its use is really limited to a shorter period because of the five hours difference in time.

Radiotelegraph is open to the public for communication from the United States to the following countries: England, France, Germany, Italy, Poland, Norway, Sweden, Holland, Argentina, Brazil, St. Martins, Japan, Philippines, Dutch East Indies, French Indo-China, Colombia, Panama, Costa Rica, Nicaragua, Honduras, and Guatemala. This service also includes Swan Island in the Caribbean Sea and Hawaii.

Short waves (below 75 meters) are proving serviceable for transoceanic communication. Such circuits are now in use to England, Germany, Argentina, Philippines, Dutch East Indies, French Indo-China, and Hawaii. Expansion of this service is contemplated.

Beam transmission is now successfully accomplished. Shortly two circuits using this system will be put into operation in this country.

INTERNATIONAL RADIOTELEGRAPH CONFERENCES

As early as 1903 the use of radiotelegraphy for marine purposes had raised questions of international interest and it became evident that some international rules of procedure were necessary. In view of this situation the German Government invited other governments concerned to a preliminary conference in Berlin in August, 1903, where a draft of proposals was agreed upon as a basis of a convention to be discussed at a subsequent conference. There were 27 countries including the United States, represented at this preliminary conference.

After several postponements, the second conference, which was the first official International Radiotelegraph Conference, was held in Berlin in October, 1906. The deliberations covered a period of one month. The representation at this conference was much the same as that which attended the preliminary conference and included the United States. The primary object of the 1906 convention was to facilitate ship and shore communication. The subjects covered can be classified briefly as follows:

(*a*) The acceptance and transmission of telegrams.

(*b*) The adoption of uniform rules of working.

(*c*) The collection of charges and settlement of accounts between the different countries.

(*d*) Arrangement for publication of information necessary for intercommunication.

(*e*) Rules to prevent interference and confusion in working.

(*f*) Provision for intercommunication, with certain exceptions.

This convention was ratified by the United States on April 22, 1912.

The second official International Radiotelegraph Conference was held in London in 1912. The first meeting was held on June 4. The deliberations covered a period of about one month. There were 43 countries represented, including the United States. As at the former conference, the deliberations were confined to questions relating to the marine service. At that time transoceanic communication by radiotelegraphy had not been developed, the radiotelephone was of crude design, expensive, and unreliable in operation, and its use entirely experimental. The amateurs had not entered the intrenational communication field, and point-to-point service was limited to short distances with low power and given wave lengths which did not interfere seriously with the marine service.

The London convention was ratified by the United States on February 5, 1913.

At the London conference the United States delegation was authorized to extend an invitation to hold the next conference in Washington in 1917. Subsequent events made several postponements necessary. Finally the date was set as October 4, 1927, 10 years later than originally contemplated. During this lapse of time many unforeseen problems have arisen and the development and use of radio has rendered the old treaty obsolete. A complete revision of the convention is necessary to meet the present operating conditions, taking into consideration modern apparatus, more efficient methods, and new services.

INTERNATIONAL RADIO ACCOUNTING

The London radiotelegraph convention of 1912, to which the United States is signatory, requires each administration to provide for the collection of tolls from vessels under its registry for radio service exchanged through stations of other administrations.

The following summary covers the principal operations of the accounting section of the radio division for the period from July 1, 1926, to June 30, 1927, in carrying out the terms of the convention:

Accounts received from and settled with other administrations and companies

Accounts on hand July 1, 1926	644
Accounts received during year	969
Total	1, 613
Accounts settled and cleared	914
Accounts on hand and unsettled June 30, 1927	699

The financial operations were as follows:

Cash balance, July 1, 1926	$44, 214. 47
Collections from American companies	85, 927. 47
Total	130, 141. 94
Disbursements to foreign administrations and companies	62, 259. 53
Cash balance, June 30, 1927	67, 882. 41

The accounts mentioned above range in value from $1 to $2,000 each. The number of administrations and foreign companies acting independently of administrations and submitting accounts for collection during the year was 101; the individual accounts covered periods of from one to six months each. It is to be noted that the accounts are itemized message by message, all of which are required to be billed against the responsible ship or radio authorities. The accounting section of the radio division operates as an international clearing house for radio traffic accounts, collecting the amounts due from shipowners or private radio companies, and liquidating with the foreign administrations.

In addition to the foregoing, the radio division has assisted American radio companies in the collection of accounts due them from foreign administrations and companies covering the tolls for service rendered foreign ships by domestic coastal stations. Canada, Spain, Italy, Greece, and other administrations have availed themselves frequently of this method of settling their accounts with American companies.

ACKNOWLEDGMENT

I desire to bring to your attention the helpful cooperation which the radio division has received from the industries and to acknowledge my appreciation of their assistance, without which we could not have successfully functioned.

Very truly yours,

W. D. Terrell,
Chief, Radio Division.

STATISTICAL TABLES

Submitted below are statistics covering the division's work.

SCOPE OF WORK

The following table shows the inspection and licensing work performed yearly from 1914 to 1927, inclusive, and the number of persons employed in the field force:

June 30—	American ships equipped	American ships licensed	Inspections of American and foreign ships	Commercial operators licensed	Commercial and special land stations licensed	Amateur stations licensed	Amateur operators licensed	Total field force
1914	555	203	6, 484	339	83	2, 137	1. 172	20
1915	585	362	6, 152	1, 653	115	3, 547	3, 067	26
1916	604	444	7, 236	1, 278	182	4, 942	4, 199	28
1917	836	484	7, 137	1. 682	160	3, 741	3, 303	28
1918	1, 478	392	5, 575	1, 616				29
1919	2, 312	976	5, 160	1, 645				27
1920	2, 808	1, 158	5, 419	4, 652	254	5, 719	6, 103	25–45
1921	2, 978	921	5, 591	2, 722	491	7, 351	6, 207	26
1922	2, 773	1, 174	6, 071	3, 136	1, 086	9. 525	8, 920	35
1923	2, 723	945	6, 933	2, 860	1, 375	7, 821	9, 908	53
1924	2, 741	1, 382	7, 727	3, 370	1, 489	8, 205	9, 545	53
1925	1, 901	976	8, 603	3, 215	1, 129	10, 074	8, 293	62
1926	1, 954	1, 258	9, 197	3, 398	1, 072	8, 037	8, 140	65
1927	2, 092	[1] 558	9, 330	3, 463	1, 260	7, 123	7, 275	63

[1] This figure represents licenses issued during the first half of the fiscal year 1927. The Federal Radio Commission, established in accordance with the radio act of 1927, extended all expiring ship station licenses.

DETAILED WORK OF THE RADIO SERVICE

The following statement shows the details of the work performed during the past fiscal year compared with 1926 and the total number of licensed and Government radio stations:

Work of service	1926	1927
Clearances of American and foreign vessels required by law to be equipped with radio	13, 009	13, 657
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	9, 197	9, 330
Inspections of radio equipment on voluntarily equipped vessels	1, 583	1, 406
American ship radio stations licensed	1, 258	[1] 558
American ship radio stations inspected for license	1, 048	854
Land stations inspected for license	1, 088	113
Amateur stations licensed	8, 037	7, 123
Commercial operators examined	3, 144	3, 328
Commercial operators licensed	3. 398	3, 463
Amateur operators examined	5, 456	5, 597
Amateur operators licensed	8, 140	7, 275
Defects found upon inspection of ship radio stations where clearance would have been in violation of the law	332	285
Licensed and Government radio stations:		
American vessels equipped with radio	1, 954	2, 092
Special land stations	225	226
Commercial land stations	319	340
Limited commercial (broadcasting) stations	528	694
Amateur stations	14, 902	15, 926
Government land stations	325	333
Government ship stations	1, 155	1, 203

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[1] This figure represents licenses issued during the first half of the fiscal year 1927. The Federal Radio Commission, established in accordance with the radio act of 1927, extended all expiring ship station licenses.

OPERATORS LICENSED

The following table shows the number of radio operators licensed during the past two years:

Class and grade	1926	1927	Total
Commercial extra first class	21	20	41
Commercial first class	2,753	2,773	5,526
Commercial second class	616	669	1,285
Commercial grade 4	8	1	9
Experiment and instruction	11	6	17
Cargo	4	9	13
Amateur extra first grade	112	29	141
Amateur first grade	4,509	3,927	8,436
Amateur second grade	3,519	3,319	6,838
Total	11,553	10,753	22,306

COST OF RADIO SERVICE

The following statement shows the detailed expenditures of the radio service for 1927 and the appropriation and proposed allotment for the fiscal year 1928.

	1928	1927
Total salaries:		
District of Columbia	$44,930.00	$43,625.22
Field	146,515.00	142,018.95
Total	191,445.00	185,644.17
General expenses:		
Travel and subsistence	11,800.00	11,302.80
Furniture and fixtures, office	1,400.00	6,165.91
Test cars and equipment	2,365.00	26,273.55
Technical instruments and supplies	2,300.00	5,660.51
Rents	6,300.00	4,694.63
General expenses—Contd.		
Office supplies and stationery	$1,800.00	$1,445.37
Communications	2,140.00	1,973.67
Miscellaneous expenses	450.00	427.19
Federal Radio Commission	[1] 50,000.00	25,036.78
Total	78,555.00	82,980.41
Unobligated and unexpended		66,375.42
Grand total	270,000.00	335,000.00

[1] The estimates of expenditures for the fiscal year 1928 include an allotment of $50,000 to the Federal Radio Commission. A provision in the radio act of 1927 made funds appropriated for the radio service available for the use of the radio commission in the event Congress should be unable to make specific appropriation for that commission. The allotment to the commission, therefore, creates a deficiency of $50,000 for the fiscal year 1928, and the figures shown in the grand total of estimated expenditures for that year are $50,000 in excess of the appropriation of $220,000 for that year.

FIELD ACTIVITIES

Following is a statement, by districts, of the work performed during the past fiscal year compared with the previous year:

Place of inspection or examination (city or town)	Stations inspected					Amateur stations licensed	Operators examined							Operators licensed						
							Commercial			Amateur				Commercial			Amateur			
	Ship, voluntary equipment	Ship for license	Land ¹	Land for license ¹	General and restricted amateur		Extra first	First	Second	First	Second	Extra first	Cargo	Extra first	First	Second	First	Second	Extra first	Cargo
First district:																				
Boston, Mass	77	36	14	5	4	797	......	269	16	178	242	1	......	1	253	59	454	250	10	......
Outside district headquarters	2	2	21	7	12	......	......	3	......	10	......	......	......	......	......	......	......	......	......	......
Total, 1927	79	38	35	12	16	797	......	272	16	188	242	1	......	1	253	59	454	250	10	......
Total, 1926	42	29	89	21	83	836	......	230	13	207	109	1	......	......	202	49	712	287	15	......
Second district:																				
New York, N. Y	286	274	58	3	1	696	1	419	62	359	29	......	12	5	689	61	506	33	......	7
Outside district headquarters	137	118	36	1	......	......	......	35	13	37	......	......	......	......	......	......	......	......	......	......
Total, 1927	423	392	94	4	1	596	1	454	75	396	29	......	12	5	689	61	506	33	......	7
Total, 1926	501	501	194	119	29	657	6	514	82	500	40	1	5	12	696	67	599	42	5	4
Third district:																				
Baltimore, Md	54	38	9	3	1	408	1	108	23	31	58	......	......	2	169	32	338	63	1	......
Philadelphia, Pa	27	16	20	3	3	......	......	77	29	64	......	......	......	......	52	5	3	......	......	......
Norfolk, Va	48	37	9	1	2	......	......	36	17	18	......	......	1	......	27	12	19	......	......	......
Outside district offices	1	......	26	1	4	......	......	......	......	14	......	......	......	......	......	......	......	......	......	......
Total, 1927	130	91	64	8	10	408	1	221	69	127	58	......	1	2	248	49	360	63	1	......
Total, 1926	209	121	151	25	125	688	......	232	39	129	71	......	......	1	303	40	531	71	16	......
Fourth district:																				
Atlanta, Ga	......	......	......	......	......	296	1	27	7	28	143	1	......	......	91	18	134	170	4	......
Outside district headquarters	......	......	29	......	......	......	......	36	17	79	......	3	......	......	......	......	......	......	......	......
Total, 1927	......	......	29	......	......	296	1	63	24	107	143	4	......	......	91	18	134	170	4	......
Total, 1926	7	7	73	26	......	232	......	46	20	59	117	2	......	......	59	19	75	138	5	......
Fifth district:																				
New Orleans, La	105	89	5	4	3	565	......	136	29	20	346	......	1	4	348	50	148	388	4	1
Outside district headquarters	47	31	51	6	1	......	......	130	67	120	......	1	......	......	......	......	......	......	......	......
Total, 1927	152	120	56	10	4	565	......	266	96	140	346	1	1	4	348	50	148	388	4	1
Total, 1926	137	104	192	151	297	408	......	247	33	190	339	7	......	1	318	55	159	313	8	......

Sixth district:																				
San Francisco, Calif.	182	86	11	2		1, 260		229	36	140	140	1	1	8	522	104	805	198	3	1
Outside district headquarters	13	12	58	1	3			200	60	333										
Total, 1927	195	98	69	3	3	1, 260		429	96	473	140	1	1	8	522	104	805	198	3	1
Total, 1926	155	129	225	111	33	1, 156	1	522	87	378	92	3		6	575	87	788	159	30	
Seventh district:																				
Seattle, Wash.	149	39	44	15	1	384	2	118	39	44	50				196	61	233	104	1	
Outside district headquarters	8	3	61	2				86	75	137		1								
Total, 1927	157	42	105	17	1	384	2	204	114	181	50	1			196	61	233	104	1	
Total, 1926	231	87	156	101	9	383		225	86	124	77				236	65	198	119	3	
Eighth district:																				
Detroit, Mich.	83	21	9	5	1	837		94	16	55	376				174	79	447	767	3	
Outside district headquarters	17	16	40	19	4			62	34	230										
Total, 1927	100	37	49	24	5	837		156	50	285	376				174	79	447	767	3	
Total, 1926	56	43	196	168	71	1, 634	1	170	35	307	393	5		1	156	63	683	940	25	
Ninth district:																				
Chicago, Ill.	160	33	51	26		1, 980	1	338	147	534	1, 349	2			252	188	840	1, 346	3	
Outside district headquarters	9	3	129	9	23			143	88	412		1								
Total, 1927	169	36	180	35	23	1, 980	1	481	235	946	1, 349	3			252	188	840	1, 346	3	
Total, 1926	245	27	1, 071	366	118	1, 953		349	198	842	1, 458	5			208	162	764	1, 450	5	
SUMMARY																				
First district	79	38	35	12	16	707		272	16	188	242	1		1	253	59	454	250	10	
Second district	423	392	94	4	1	596	1	454	75	396	29		12	5	689	61	506	33		7
Third district	130	91	64	8	10	408	1	221	69	127	58		1	2	248	49	360	63	1	
Fourth district			29			296	1	63	24	107	143	4			91	18	134	170	4	
Fifth district	152	120	56	10	4	565		266	96	140	346	1	1	4	348	50	148	388	4	1
Sixth district	195	98	69	3	3	1, 260		429	96	473	140	1	1	8	522	104	805	198	3	1
Seventh district	157	42	105	17	1	384	2	204	114	181	50	1			196	61	233	104	1	
Eighth district	100	37	49	24	5	837		156	50	285	376				174	79	447	767	3	
Ninth district	169	36	180	35	23	1, 980	1	481	235	946	1, 349	3			252	188	840	1, 346	3	
Grand total, 1927	1, 405	854	681	113	63	7, 123	6	2, 546	775	2, 843	2, 733	11	15	20	2, 773	669	3, 927	3, 319	29	9
Grand total, 1926	1, 583	1, 048	2, 347	1, 088	765	8, 037	8	2, 535	593	2, 736	2, 696	24	5	21	2, 753	616	4, 509	3, 519	112	4

[1] Coast, inland, and special land stations.

Selection from

ANNUAL REPORT

OF THE

CHIEF OF RADIO DIVISION

TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1928

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON
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RADIO DIVISION

Department of Commerce,
Radio Division,
Washington, July 2, 1928.

The honorable the Secretary of Commerce.

Dear Mr. Secretary: In response to your request I furnish the following condensed report of the work of the radio division during the past fiscal year.

The radio act of 1927 gave the Federal Radio Commission full authority to license radio-transmitting stations during the period of one year from the date of its first meeting, which was March 15, 1927, to determine to whom licenses shall be granted and to fix the power, wave lengths, and hours of operation. From and after one year after the first meeting of the commission the general administrative powers of the commission were transferred to the Secretary of Commerce. After extensive hearings an act continuing for one year the powers and authority of the Federal Radio Commission under the radio act of 1927 was passed by Congress and approved March 28, 1928. During this period the radio division continues the inspection of all licensed stations, land and ship, examines and licenses radio operators, and performs all of the field work necessary for the enforcement of the law.

RADIO INSPECTION SERVICE

During the fiscal year 9,093 inspections were made of the radio installations on American and foreign vessels clearing from our ports, as compared with 9,330 the previous year. The inspections made developed 235 cases of defective apparatus, lack of proper equipment or personnel, etc. There were 1,139 inspections of ship stations for license, as compared with 854 the previous year. Examinations were given 2,983 applicants for commercial operators' licenses and 5,687 applicants for amateur operators' licenses. The demands for service by the Federal Radio Commission in monitoring broadcasting stations, etc., make it necessary to enlarge our force and obtain improved radio-inspection equipment. New offices have been established at Buffalo, N. Y., and Duluth, Minn. Arrangements are being made to open additional offices at Dallas, Tex., Kansas City, Mo., St. Paul, Minn., Los Angeles, Calif., and Denver, Colo.

RADIO TEST CARS

During the fiscal year there were placed in operation three new radio test cars, making a total of four in active operation in the field. Through the use of these cars considerable money has been saved the

Government in the performance of the duties required under the radio laws.

These cars are in reality traveling laboratories and offices, equipped to perform any duties pertaining to district headquarters. They carry complete frequency-measuring apparatus, radio-field intensity measuring equipment, apparatus for the examination of radio operators, and all other equipment necessary for the proper performance of any work required under existing radio laws. The cars have been enthusiastically received and approved by the broadcast listeners and by the radio broadcast industry in general, since through their use it has been possible for the radio division to render much better service.

NEW EQUIPMENT

RADIO-FIELD INTENSITY-MEASURING EQUIPMENT

During the fiscal year four radio-field intensity-measuring sets were installed on radio test cars of the division. The development and use of these sets makes it now possible to regulate power on a more scientific basis. The sets are a combination monitoring and field intensity-measuring equipment and are useful over a band of wave lengths from 30 to 1,250 meters for frequency-measuring purposes and will measure field intensity or power on wave lengths from 50 to 600 meters. As field strength measuring apparatus they are capable of measuring the strength of received radio signals over a range from 10 microvolts per meter to 2 volts per meter.

It is now possible through the use of this apparatus to determine the amount of power which any radio station uses without the inspectors entering the station. Any change in the station's power can at once be discovered and the amount of change determined. The radio fields of stations can be explored and mapped and the good service areas can be determined. The use of this apparatus also makes possible the determination of whether the power used by any radio station is such as to cause unnecessary interference with the reception of other stations.

CONSTANT FREQUENCY STATION

The radio division has been very seriously handicapped in the discharge of its functions by the almost total lack of reliable radio receiving and measuring equipment. It has been very difficult, for example, to check the frequencies used by broadcast stations, and on the higher frequencies little or no frequency measurements have been made. The operation of a large number of radio transmitters in the United States and throughout the world without heterodyne interference depends very largely upon the ability of the radio division to receive signals from all these stations and to measure their frequencies with unquestioned accuracy.

To meet this situation the radio division has placed an order for special radio receivers and accurate frequency measuring equipment which will permit placing into operation a system of frequency measurements which will enable the division to supply accurate information regarding the maintenance of assigned frequencies by all stations.

One constant-frequency station will be installed in a centrally located mid-Western State. Radio receivers as sensitive as any obtainable will be a part of this apparatus, together with equipment which will permit measurements of frequencies to be made on any radio signal received with a high degree of accuracy. The useful frequency ranges over which it will be possible to make measurements will be from 10 to 30,000 kilocycles. This monitoring station will be able to measure the frequencies of a large portion of the United States radio stations as well as foreign stations whose signals are capable of interfering with American stations. On the higher frequencies the latter consideration is already of great importance and is becoming a serious matter.

SECONDARY STANDARDS OF FREQUENCY

To supplement the work to be done by the constant-frequency station located in the geographic center of the United States, the division has purchased a number of secondary standards of frequency and receivers to be installed in the offices of the supervisors of radio and suboffices of the division.

With this equipment it will be possible to make highly accurate measurements of frequency over a range between 100 and 30,000 kilocycles.

RADIO COMPASS

Although there is no law or Federal regulation requiring the use of the radio compass on ships, the number of such installations continues to increase. The voluntary use of this device clearly indicates its value as an aid to navigation. Encouragement has been given to the use of the radio direction finder through the erection by the Lighthouse Service of radiobeacons (invisible lighthouses) along the sea coasts, distributed as follows: Atlantic coast, 20; Gulf coast, 3; Pacific coast, 10; Great Lakes, 20; Alaska, 2; Hawaii, 1; total 56. According to our latest information there are 57 radiobeacons in use in foreign countries.

AUTOMATIC ALARM SIGNAL DEVICE

During the year a considerable number of foreign vessels arrived in our ports fitted with automatic alarm signal devices. These devices are intended to respond automatically to a combination of dashes, setting into operation a buzzer or bell which serves to attract attention. The signal is to be sent by vessels in distress and to precede the usual distress signal S O S. Under the rules of the British Board of Trade, British vessels are permitted to dispense with the services of the second operator on vessels of the second class where the automatic device is used. According to reports from our inspectors there is no record of the device having responded to the prescribed signal, nor is there any record of such signal having been sent. A large number of the reports show that the device has been actuated by other signals, some radio and some static.

MONITORING BROADCASTING STATIONS

For the purpose of supplying information to the Federal Radio Commission as required in its General Order No. 7, of April 28, 1927, fixing a maximum of one-half kilocycle as the extreme variation from authorized frequency permitted to broadcasting stations, the inspection force of the radio division monitored these stations 732 hours during daytime and 2,881 hours nighttime during the fiscal year, resulting in 1,825 reports being made of broadcasting stations deviating 500 cycles or more. The instructions of the radio division required the supervisors of radio to notify the station owner when such deviation was found and reported, giving the owner opportunity to correct the error. Preparations are being made to expand activity in this field. It is recognized that frequency stability is essential to prevent interference nationally and internationally.

CHANGES AND EXTENSIONS IN SERVICE

MARINE SERVICE

Within the year the following important changes took place affecting the marine service: The Independent Wireless Telegraph Co. was taken over by the Radio Corporation of America. The Radiomarine Corporation of America was organized December 30, 1927, to take over all the marine radio activities of the two companies. Under the new arrangement the spark transmitters used at coast stations by the Independent Wireless Telegraph Co. are to be replaced by modern apparatus, thereby relieving much of the interference heretofore existing, concerning which many complaints had been filed by broadcast listeners.

In the latter part of 1927 the Federal Telegraph Co. sold to the Mackay Radio & Telegraph Co., a California corporation, its coastal and point-to-point radio stations. The new company proposes to engage in transoceanic service in addition to the point-to-point and marine service formerly engaged in by the Federal Telegraph Co.

The Robert Dollar Co. is making arrangements to engage in the marine radio service with stations open to general public correspondence.

TRANSOCEANIC SERVICE

Radio service to foreign countries has been extended and made more reliable, particularly during heavy static periods, by the use of short waves (high frequencies). During the year 1927 the Radio Corporation of America extended its direct international service to the following countries: Dutch West Indies, Philippines, Dutch Guiana, Colombia, Venezuela, Belgium, Porto Rico, Turkey, and Hong Kong (via Philippines).

The Mackay Radio & Telegraph Co. plans an extensive international radio service. The Robert Dollar Co. plans to engage in trans-Pacific service. Several other companies contemplate entering this field to a limited extent.

The American Telephone & Telegraph Co. made available to the public direct radiotelephone service between New York and London on January 7, 1927. This service has been extended to include the telephone system of North America, including Canada and Cuba on this side and that of Europe, including Great Britain, Germany, and the principal cities of Netherlands, Sweden, France, and Denmark on the other. When this service was first opened to the public a total of 4½ hours of service daily was offered; this has been increased to 15½ hours a day. During the first year calls averaged about 8 or 10 a day. Subsequent to the extension of service to the European continent and reduction in rates the number of calls has increased to 40 or 50 a day. At present one long wave and one short wave circuit is employed. Plans are being formulated to extend this service to South America, first connecting with the telephone system of the Argentine Republic. It is estimated the international radiotelephone service is now available to about 200,000,000 persons.

USE OF WAVE LENGTHS

SHORT WAVES (HIGH FREQUENCIES)

Much of the interest manifested in the use of short waves is due to the activity of the amateurs. The amateurs have used short waves for several years with considerable success in national and international communication. After the International Radio Conference, where a careful study was made of this subject, and as a result of conferences held subsequently, it became evident that the short-wave channels were being used to a considerable extent throughout the world and that the supply was far from being equal to the demand. However, some relief is promised through scientific development, such as beam or directional transmission and reception.

If plans under consideration materialize, we may soon have radio competition on short waves with our land telegraph system. Many private interests have indicated a desire to use short waves for private services. At present it does not seem possible to provide channels for many of the applicants. This difficulty may be overcome later by the use of improved apparatus.

GOVERNMENT WAVE LENGTHS

Acting under authority of the radio act of 1927, the President has assigned wave lengths for use by the interested Government departments. This action is set forth in Executive Order No. 8446–A, dated March 30, 1928. Following this action short-wave assignments were made by the Federal Radio Commission to companies engaged in or preparing to engage in transoceanic public service.

PHOTORADIO SERVICE

This new application of radio may develop into one of the most interesting and useful services. Broadly, it may include transmission and reception of moving or still pictures of individuals or scenes. Photoradio circuits have been established between New York and London, San Francisco and Hawaii, and New York and San Francisco. The present rate is $16 per inch of length for pictures and documents.

AMATEURS

The amateur radio operators have received international recognition. At the International Radiotelegraph Conference, held in Washington October 4 to November 25, 1927, agreement was reached whereby the status of the amateur radio operator was defined; his service as an experimenter and his value in promoting international good will recognized, and his continued activity assured by the allocation to him of certain specified wave lengths. This recognition was accomplished through the efforts of the delegations of Canada, Italy, Australia, New Zealand, and the United States. The new international treaty provides a new system of amateur calls to indicate nationality. The provisions of the new treaty become effective January 1, 1929.

In September, 1927, at the request of the radio division, the American Radio Relay League made a survey to determine to what extent amateurs and former amateur radio operators are occupied in the radio industry. While it was impossible to get reports from all organizations employing men coming under this heading, the list furnished gives a fair idea of the extent to which the radio art and industry has recognized the value of amateur training and experience. Of those engaged in executive positions in the radio industry, the list shows 45 presidents, 16 vice presidents, 5 general managers, 69 managers, 37 owners, 324 engineers, 19 announcers, and 11 directors. This does not include those employed as operators.

INTERNATIONAL RADIOTELEGRAPH CONFERENCE

The International Radiotelegraph Conference which held its sessions in Washington from October 4 to November 25, 1927, was composed of delegates from 79 countries, including those colonies and possessions whose delegates affixed separate signatures to the treaty which was drafted. There were nearly 300 government delegates and in addition about 75 representatives of communication companies and other interested international agencies.

The specific purpose of the conference was to revise the International Radiotelegraph Convention or treaty which was signed at London in July, 1912. It may be stated broadly that the general purpose of the conference was to formulate such provisions as are appropriate for international agreement, in order to minimize interference between radio stations engaged in international service or which are international in their interfering capabilities.

The delegation of the United States to this conference consisted of 15 men commissioned for this duty by the President. These delegates came largely from Government departments, but there were also several from private life and from the communication companies. The Secretary of Commerce was chairman of the American delegation and president of the conference.

It has been customary at previous international radiotelegraph conferences to conduct all proceedings in the French language alone. Through the efforts of the American delegation an agreement was reached whereby English was used for the discussions as well as French. Interpreters were provided by the American delegation. The official texts of the convention, regulations, and other documents were in French. English texts were prepared and distributed by the American delegation.

The treaty which was drawn up consists of three parts, known as the convention, the general regulations, and the supplementary regulations. The convention is based largely on that which was signed at London in 1912. The regulations are based to some extent on a draft of regulations for mobile radio service which was formulated at an interallied conference in Washington in 1920, the technical features having been revised at an interallied conference in Paris in 1921.

The provisions of the convention cover such matters as the licensing of radio-transmitting stations and operators, the secrecy of messages, intercommunication between coastal and ship stations, the mutual exchange of information necessary to facilitate international radio communication, the settlement of accounts in the mobile service, the establishment of an international consulting committee on radio communication, the allocation of blocks of call letters to countries, and the settlement of disputes by arbitration. The convention contains no article on the question of voting. The decisions on the questions before this conference were so nearly unanimous that on only one occasion was a roll call required at a plenary session. It was agreed that the next conference would determine its own rules governing voting.

Perhaps the most important article of the regulations is article 5, which deals with the allocation of frequency or wave-length bands to radio services. In the allocation, waves are designated in the first instance by their frequency in kilocycles per second. Following this designation there is given the approximate wave length in meters. The conversion factor used is 300,000.

The frequency allocation adopted is not an allocation to countries. It is entirely an allocation to services, the stations of all countries having equal rights to the use of the bands designated for a particular service.

There are several provisions of the regulations which gave a tacit recognition to the rights of priority of radio stations which have been in operation. For example, in paragraph 16 of article 5 it is provided that the frequencies assigned to all new fixed land or broadcasting stations must be chosen in such a manner as to prevent as far as possible interference with international services carried on by existing stations, the frequencies of which have already been notified to the International Bureau. Another provision of this article requires that notice be sent in advance to the International Bureau of the establishment of stations using frequencies below 37.5 kilocycles per second (wave lengths above 8,000 meters) in case the use of this frequency might cause international interference over broad areas. Similar notice must be given the International Bureau regarding the operation of short-wave stations intended to carry on a regular service and which are likely to cause international interference.

The frequency allocations to the various services conform in their major divisions to the assignments which have been used in the United States under the recommendations of the Fourth National Radio Conference. The band from 10 to 100 kilocycles (30,000 to 3,000 meters) is assigned to station engaged in point-to-point service, chiefly, of course, the transoceanic service. The band from 100 to

550 kilocycles (3,000 to 545 meters) has been designated primarily for ship to ship, ship to shore, and aircraft services. This includes radiobeacons on a band at about 300 kilocycles (1,000 meters) and provides for a radio-compass service on a band around 375 kilocycles (800 meters). The 500-kilocycle frequency (600 meters) is the international calling and distress wave and may be used for message traffic only on condition that interference with call signals and distress signals will not result. The band between 194 and 285 kilocycles (1,550 and 1,050 meters) was one on which it was somewhat difficult to secure agreement. The difficulty arose from the fact that many of the European countries desired to utilize this band for broadcasting. It was finally agreed that part of this band may be used for broadcasting in Europe only, and that the rest of the band will be used by mobile and aircraft services and by fixed stations not open to public correspondence.

The band from 550 to 1,500 kilocycles is now universally recognized as the broadcasting band. Permission is given to use one frequency in this band, namely, 1,365 kilocycles (220 meters) for small ships. The entire band may be used by mobile service in any part of the world where its use will not interfere with broadcasting.

The band from 1,500 to 60,000 kilocycles has been divided into 40 smaller bands and apportioned between mobile services, communication between fixed stations, broadcasting, and amateur stations. This allocation of the short waves involves some change from the Fourth National Radio Conference allocation, but has the advantage of giving some assurance that stations of a given type which begin operation in this band will be able to continue in operation subject only to the adjustment of interference with other stations engaged in a similar service.

The conference gave definite recognition to the amateur in international radio communication. The allocation to amateur service of four exclusive bands and two nonexclusive bands was secured through the efforts of the American delegation, with the support of the delegates from Canada, Australia, Italy, and New Zealand. The result is to give the amateurs much greater assurance of making contact with one another internationally.

While the conference recognized that the allocation of frequency bands to specific services was necessary in order to minimize interference, there was a corresponding desire to leave to each country or to any group of countries in a certain region as much freedom as possible in making assignments to stations which are not international in their effect. Only international stations therefore must comply with the allocation. Freedom is left for the assignment of any frequency to stations which do not cause international interference.

It was recognized as inadvisable to write into the regulations definite provisions of a technical or engineering nature which might become obsolete during the next few years. Instead, general provisions calling for the maintenance of a high technical standard were adopted. It is provided, for example, in article 4 of the General Regulations, that the waves emitted by a station must be maintained upon their authorized frequency as closely as the state of the art permits, and their radiation must be as free as practicable from all emissions not essential to the type of communication carried on.

The interested administrations shall fix the tolerance allowed between the mean frequency of emissions and the recorded frequency; they shall endeavor to take advantage of technical improvements progressively to reduce this tolerance. The width of a frequency band occupied by the emission of a station must be reasonably consistent with good current engineering practice for the type of communication involved.

In considering the use of damped wave transmitters, the conference felt that definite dates must be set on which certain restrictions would go into effect. The regulations provide that upon adoption, no more damped wave sets are to be installed at fixed or land stations; that after January 1, 1930, sets of this type to be installed on ships shall, when working on full power, use less than 300 watts measured at the input of the supply transformer. The use of existing damped wave transmitters is to be discontinued by all land stations on January 1, 1935. It is provided, however, that no restriction shall be placed upon the means which an operator of a mobile station in distress may use of attracting attention, indicate his position, and obtain assistance.

The regulations annexed to the London convention were applicable exclusively to ship-to-ship and ship-to-shore services. In the new Washington Regulations most of the provisions are applicable to mobile service which now includes aircraft as well as ships. In addition to provisions regarding the use of traffic frequencies other than the calling frequency there are regulations providing for the necessary control of traffic by land stations, the routing of messages by mobile stations, and other related matters.

Provision is of course made in the regulations for absolute priority in the mobile service for distress calls, messages, and traffic. In addition to S O S as a distress call, there is now established a radio telephone distress call which consists of a spoken expression "may day." This corresponds to the pronunciation in French of the expression which means "help me." Provision is made for the use of an alarm signal which has as its purpose the setting into operation of an automatic apparatus to give an automatic alarm and to warn someone on the ship in which it is installed that a distress signal is about to follow. The alarm signal consists of a series of 12 dashes sent in one minute, the duration of each dash being four seconds and the duration of the interval between dashes one second.

Two new urgency signals, XXX, and in the case of aircraft, PAN, are established for indicating that urgent messages are on hand concerning the safety of the ship or aircraft or of persons on board or in sight from them. A safety signal, TTT, is established to be used as a preamble to a message concerning the safety of navigation or containing meteorological warnings.

Article 6 of the General Regulations contains provisions relating to the issuance of operator's certificates. These provisions differ but little from the present practice of the United States, except for the provision that in order to secure a place as a chief operator on a vessel of the first class it will be necessary for an operator to have had a year's experience under a first-class license.

Provisions are included in the regulations designating the hours of service of ships having one or two operators, respectively. Complete revised lists of abbreviations or Q signals are included, applicable to aircraft communication as well as other situations.

Regulations are included applicable to special services such as meteorological services, time signals, notices to navigators, radio compass, and radiobeacon service. Rules are included covering the settlement of accounts in the mobile service.

The conference, throughout its work, endeavored to keep before it the principle that its conclusions should be of such a nature as not to interfere with the development of the art. It is generally felt that the convention and regulations adopted occupy a safe middle ground between avoidance of restriction and the maintenance of orderly communication. The convention and regulations become effective on January 1, 1929, for all of the governments which ratify it. The conference accepted an invitation from the Government of Spain to meet next in Madrid in 1932. Egypt and Holland had also extended invitations.

The outstanding impression left by the conference is perhaps the fact that every effort was made by all of the delegates to secure the correct solution of the problems under discussion. The technical questions in particular were usually discussed and the conclusions arrived at from a technical rather than a nationalistic standpoint. The general attitude was one of cooperation and of realization that the problems should be solved on their technical merits.

The treaty was ratified by the United States Senate on March 21, 1928.

INTERNATIONAL RADIO ACCOUNTING

The London radiotelegraph convention of 1912, to which the United States is signatory, requires each administration to provide for the collection of tolls from vessels under its registry for radio service exchanged through stations or other administrations.

The following summary covers the principal operations of the accounting section of the radio division for the period July 1, 1927, to June 30, 1928, in carrying out the terms of the convention:

Accounts received from and settled with other administrations and companies

Accounts on hand July 1, 1927	699
Accounts received during year	937
Total	1,636
Accounts settled and cleared	935
Accounts on hand and unsettled June 30, 1928	701

The financial operations were as follows:

Cash balance, July 1, 1927	$67,882.41
Collections from American companies	76,072.70
Total	143,955.11
Disbursements to foreign administrations and companies	82,091.80
Cash balance, June 30, 1928	61,863.31

The accounts mentioned above range in value from $1 to $2,000 each. The number of administrations and foreign companies acting independently of administrations and submitting accounts for collection during the year was 118; the individual accounts covered periods of from one to six months each. It is to be noted that the accounts are itemized message by message, all of which are required to be billed against the responsible ship or radio authorities. The accounting section of the radio division operates as an international clearing house for radio traffic accounts, collecting the amounts due from shipowners or private radio companies, and liquidating with the foreign administrations.

In addition to the foregoing, the radio division has assisted American radio companies in the collection of accounts due them from foreign administrations and companies covering the tolls for service rendered foreign ships by domestic coastal stations. Canada, Spain, Italy, Greece, Brazil, Peru, and other administrations have availed themselves frequently of this method of settling their accounts with American companies.

Very truly yours,

W. D. Terrell,
Chief, Radio Division.

STATISTICAL TABLES

Submitted below are statistics covering the division's work.

SCOPE OF WORK

The following table shows the inspection and licensing work performed yearly from 1914 to 1928, inclusive, and the number of persons employed in the field force:

June 30—	American ships equipped	American ships licensed	Inspections of American and foreign ships	Commercial operators licensed	Commercial and special land stations licensed	Amateur stations licensed	Amateur operators licensed	Total field force
1914	555	203	6, 484	339	83	2, 137	1, 172	20
1915	585	362	6, 152	1, 653	115	3, 547	3, 067	26
1916	604	444	7, 236	1, 278	182	4, 942	4, 199	28
1917	836	484	7, 137	1, 682	160	3, 741	3, 303	28
1918	1, 478	392	5, 575	1, 616				29
1919	2, 312	976	5, 160	1, 645	----------	----------	----------	27
1920	2, 808	1, 158	5, 419	4, 652	254	5, 719	6, 103	25–45
1921	2, 978	921	5, 591	2, 722	491	7, 351	6, 207	26
1922	2, 773	1, 174	6, 071	3, 136	1, 086	9, 525	8, 920	35
1923	2, 723	945	6, 933	2, 860	1, 375	7, 821	9, 908	53
1924	2, 741	1, 382	7, 727	3, 370	1, 489	8, 205	9, 545	53
1925	1, 901	976	8, 603	3, 215	1, 129	10, 074	8, 293	62
1926	1, 954	1, 258	9, 197	3, 398	1, 072	8, 037	8, 140	65
1927	2, 092	[1] 558	9, 330	3, 463	1, 260	7, 123	7, 275	63
1928	2, 166	(1)	9, 093	3, 816	(1)	12, 386	8, 369	78

[1] Radio station licenses for ships and land stations were issued by the Federal Radio Commission during the fiscal year 1928.

DETAILED WORK OF THE RADIO SERVICE

The following statement shows the details of the work performed during the past fiscal year compared with 1927 and the total number of licensed and Government radio stations:

Work of service	1927	1928
Clearances of American and foreign vessels required by law to be equipped with radio	13, 657	14, 305
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	9, 330	9, 093
Inspections of radio equipment on voluntarily equipped vessels	1, 405	1, 659
American ship radio stations licensed	[1] 558	(1)
American ship radio stations inspected for license	854	1, 139
Land stations inspected for license	113	12
Amateur stations licensed	7, 123	12, 386
Commercial operators examined	3, 328	2, 983
Commercial operators licensed	3, 463	3, 816
Amateur operators examined	5, 597	5, 687
Amateur operators licensed	7, 275	8, 369
Defects found upon inspection of ship radio stations where clearance would have been in violation of the law	285	235
Licensed and Government radio stations:		
American vessels equipped with radio	2, 092	[2] 2, 166
Special land stations	226	234
Commercial land stations	340	[2, 3] 312
Limited commercial (broadcasting) stations	694	[3] 691
Amateur stations	15, 926	16, 928
Government land stations	333	400
Government ship stations	1, 203	1, 216

[1] This figure represents licenses issued during the first half of the fiscal year 1927. The Federal Radio Commission, established in accordance with the radio act of 1927, extended all expiring ship station licenses.

[2] Stations in the Philippine Islands are not included.

[3] A number of stations for which construction permits have been issued are not included in these figures.

OPERATORS LICENSED

The following table shows the number of radio operators licensed during the past two years:

Class and grade	1927	1928	Total
Commercial extra first class	20	17	37
Commercial first class	2, 773	3, 088	5, 861
Commercial second class	669	711	1, 380
Commercial grade 4	1	(1)	1
Experiment and instruction	6	(1)	6
Cargo	9	(1)	9
Amateur extra first grade	29	(2)	29
Amateur first grade	3, 927	4, 424	8, 351
Amateur second grade	3, 319	3, 945	7, 264
Total	10, 753	12, 185	22, 938

[1] Discontinued.
[2] Discontinued during fiscal year 1928; reestablished in July, 1928.

COST OF RADIO SERVICE

The following statement shows the detailed expenditures of the radio service for 1928 and the appropriation and proposed allotment for the fiscal year 1929.

	1928	1929
Salaries:		
District of Columbia	$43, 710. 97	$56, 220. 00
Field	155, 386. 26	232, 165. 00
General expenses:		
Travel and subsistence	13, 008. 98	16, 000. 00
Furniture and fixtures, office	6, 031. 48	2, 000. 00
Test cars and equipment	3, 237. 60	16, 910. 00
Technical instruments		
Technical instruments and supplies	86, 825. 65	120, 405. 00
Rents	7, 098. 36	19, 050. 00
General expenses—Contd.		
Office supplies and stationery	$2, 333. 91	$3, 475. 00
Communications	2, 178. 92	3, 400. 00
Miscellaneous expenses	1, 037. 29	2, 210. 00
Federal Radio Commission	42, 234. 99	----------
Total	[1] 363, 084. 41	[2] 471, 865. 00
Unobligated and unexpended	915. 59	----------
Total appropriation	364, 000. 00	----------

[1] Excluding the sum of $42,234.99 from the total general expenses shown for the fiscal year 1928, it will be seen that the cost of operation for the radio division amounted to $320,849.42.
[2] The total amount appropriated for the fiscal year 1929 is $460,000, the excess shown in the proposed expenditures for that fiscal year being caused by the additional amount required for salary adjustments necessitated by the Welch Act.

FIELD ACTIVITIES

Following is a statement, by districts, of the work performed during the past fiscal year compared with the previous year:

Place of inspection or examination	Stations inspected						Amateur stations licensed	Operators examined							Operators licensed						
								Commercial			Amateur				Commercial			Amateur			
	Ship, required to be equipped [1]	Ship, voluntarily equipped	Ship for license	Land [1]	Land for license [2]	Amateur		Extra, first	First	Second	First	Second	Extra, first [2]	Cargo [3]	Extra, first	First	Second	First	Second	Extra, first [2]	Cargo [3]
First district:																					
Boston, Mass	1,221	74	59	10			1,181		259	35	170	194		1	1	257	62	638	271		1
Outside district headquarters		7	6	45		12															
Total, 1928	1,221	81	65	55		12	1,181		259	35	170	194		1	1	257	62	638	271		1
Total, 1927	1,141	79	38	35	12	16	797		272	16	188	242	1		1	253	59	454	250	10	
Second district:																					
New York, N. Y	3,218	409	421	12	2	47	1,189	3	425	63	394	46			10	747	60	604	48		
Outside district headquarters		158	162	20	2	5			33	26	20										
Total, 1928	3,218	567	583	32	4	52	1,189	3	458	89	414	46			10	747	60	604	48		
Total, 1927	3,630	423	392	94	4	1	596	1	454	75	396	29		12	5	689	61	50	33		7
Third district:																					
Baltimore, Md	423	42	34	4	3	5	1,121		49	10	26	11				144	21	408	79		
Philadelphia, Pa	493	11	15	19	2	8			79	14	99					107	28	62			
Norfolk, Va	554	14	9	8					17	12	25					22	15	18			
Outside district offices	38	1		11	1	2				11	28										
Total, 1928	1,508	68	58	42	6	15	1,121		145	47	178	11				273	64	488	79		
Total, 1927	1,634	130	91	64	8	10	408	1	221	69	127	58		1	2	248	49	360	63	1	
Fourth district:																					
Atlanta, Ga				1			622		39	13	26	147				86	23	69	191		
Outside district headquarters	2			28					35	22	25										
Total, 1928	2			29			622		74	35	51	147				86	23	69	191		
Total, 1927				29			296	1	63	24	107	143	4			91	18	134	170	4	
Fifth district:																					
New Orleans	619	51	53	4			903		142	39	31	410			1	431	91	204	463		
Outside district headquarters	23	57	56	188		25			104	57	116										
Total, 1928	642	108	109	192		25	903		246	96	147	410			1	431	91	204	463		
Total, 1927	604	152	120	56	10	4	565		266	96	140	346	1	1	4	348	50	148	388	4	1

Sixth district:																					
San Francisco, Calif.	1,316	254	181	30	-----	7	1,011	2	228	26	183	190	-----	-----	4	598	87	1,036	277	-----	---
Outside district headquarters	1	1	2	127	-----	8	-----	-----	171	66	337	-----	-----	-----	-----	-----	-----	-----	-----	-----	---
Total, 1928	1,317	255	183	157	-----	15	1,011	2	399	92	520	190	-----	-----	4	598	87	1,036	277	-----	---
Total, 1927	1,267	195	98	69	3	3	1,260	-----	429	96	473	140	1	1	8	522	104	805	198	3	1
Seventh district:																					
Seattle, Wash.	576	204	93	21	1	8	893	-----	113	66	71	103	-----	-----	-----	263	93	208	137	-----	---
Outside district headquarters	36	12	12	62	-----	21	-----	-----	73	60	108	-----	-----	-----	-----	-----	-----	-----	-----	-----	---
Total, 1928	612	216	105	83	1	29	893	-----	186	126	179	103	-----	-----	-----	263	93	208	137	-----	---
Total, 1927	621	157	42	105	17	1	384	2	204	114	181	50	1	-----	-----	196	61	233	104	1	---
Eighth district:																					
Detroit, Mich.	243	223	8	7	-----	-----	2,240	-----	100	11	101	755	-----	-----	1	178	57	489	903	-----	---
Buffalo, N. Y.[4]	34	47	8	1	-----	1	41	-----	3	-----	4	26	-----	-----	-----	1	-----	9	26	-----	---
Outside district offices	-----	19	11	83	-----	10	-----	-----	49	14	218	-----	-----	-----	-----	-----	-----	-----	-----	-----	---
Total, 1928	277	289	27	91	-----	11	2,281	-----	152	25	323	781	-----	-----	1	179	57	498	929	-----	---
Total, 1927	277	100	37	49	24	5	837	-----	156	50	285	376	-----	-----	-----	174	79	447	767	3	---
Ninth district:																					
Chicago, Ill.	295	70	4	67	1	9	3,185	1	303	115	345	1,334	-----	-----	-----	254	174	679	1,550	-----	---
Duluth, Minn.[4]	1	3	3	6	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	---
Outside district offices	-----	2	2	112	-----	15	-----	-----	66	29	144	-----	-----	-----	-----	-----	-----	-----	-----	-----	---
Total, 1928	296	75	9	185	1	25	3,185	1	369	144	489	1,334	-----	-----	-----	254	174	679	1,550	-----	---
Total, 1927	156	169	36	180	35	23	1,980	1	481	235	946	1,349	3	-----	-----	252	188	840	1,346	3	---
SUMMARY																					
First district	1,221	81	65	55	-----	12	1,181	-----	259	35	170	194	-----	1	1	257	62	638	271	-----	1
Second district	3,218	567	583	32	4	52	1,189	3	458	89	414	46	-----	-----	10	747	60	604	48	-----	---
Third district	1,508	68	58	42	6	15	1,121	-----	145	47	178	11	-----	-----	-----	273	64	488	79	-----	---
Fourth district	2	-----	-----	29	-----	-----	622	-----	74	35	51	147	-----	-----	-----	86	23	69	191	-----	---
Fifth district	642	108	109	192	-----	25	903	-----	246	96	147	410	-----	-----	1	431	91	204	463	-----	---
Sixth district	1,317	255	183	157	-----	15	1,011	2	399	92	520	190	-----	-----	4	598	87	1,036	277	-----	---
Seventh district	612	216	105	83	1	29	893	-----	186	126	179	103	-----	-----	-----	263	93	208	137	-----	---
Eighth district	277	289	27	91	-----	11	2,281	-----	152	25	323	781	-----	-----	1	179	57	498	929	-----	---
Ninth district	296	75	9	185	1	25	3,185	1	369	144	489	1,334	-----	-----	-----	254	174	679	1,550	-----	---
Grand total, 1928	9,093	1,659	1,139	866	12	184	12,380	6	2,288	689	2,471	3,216	-----	1	17	3,088	711	4,424	3,945	-----	1
Grand total, 1927	9,330	1,405	854	681	113	63	7,123	6	2,546	775	2,843	2,733	11	15	20	2,773	669	3,927	3,319	29	9

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[1] Coast, inland, and special stations.
[2] Discontinued during the fiscal year 1928: reestablished in July, 1928.
[3] Discontinued.
[4] This office established in June, 1928.

U. S. DEPARTMENT OF COMMERCE
R. P. LAMONT, Secretary
RADIO DIVISION
W. D. TERRELL, Chief

Selection from

ANNUAL REPORT

OF THE

CHIEF OF RADIO DIVISION

TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1929

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RADIO DIVISION

Department of Commerce,
Radio Division,
Washington, July 1, 1929.

The honorable the Secretary of Commerce.

Dear Mr. Secretary: In response to your request I furnish the following condensed report of the work of the radio division during the past fiscal year, including references to related developments which have taken place during the year.

Under authority of an act of Congress approved March 4, 1929, all the powers and authority vested in the Federal Radio Commission by the radio act of 1927 are continued to be vested in and exercised by the commission until December 31, 1929. The radio division continues the inspection of all licensed radio stations, land and ship; examines and licenses radio operators; checks the frequencies of stations; measures the field strength of stations; and performs all of the field work necessary for the enforcement of the ship radio act, the radio act of 1927, and the International Radiotelegraph Convention of 1927. The radio act of 1927 limits the period of a broadcasting station license to three months and all other classes of radio station licenses to a period not exceeding one year. These licenses are issued by the Federal Radio Commission, with the exception of amateur and technical and training-school station licenses which are issued by the radio division by authority of the Federal Radio Commission.

RADIO INSPECTION SERVICE

During the fiscal year 10,715 inspections were made of radio installations on American and foreign vessels clearing from our ports as compared with 9,093 the previous year. The inspections made developed 335 cases of defective apparatus, lack of proper equipment or personnel, etc. There were 15,023 clearances of such vessels as compared with 14,305 during the previous year. There were 1,102 inspections of ship stations for license as compared with 1,139 the previous year. There were 1,154 inspections of commercial land stations and 229 inspections of amateur stations as compared with 866 and 184, respectively, the previous year. Examinations were given 3,477 applicants for commercial operators' licenses and 3,163 applicants for amateur operators' licenses. During the year offices were established at Kansas City, Mo., St. Paul, Minn., Dallas, Tex., and Los Angeles, Calif. Consideration has been given to locating offices at Denver, Colo., Hawaii, and Alaska. This can not be accomplished until additional personnel is available and some additional equipment is obtained, although there is pressing need for them. It is hoped that Denver and Hawaii can be opened this fall and Alaska next spring.

It is expected there will be a considerable increase in the duties of the inspection service during the coming year, due to the extensive use of radio in the aviation service and the operation of numerous point-to-point commercial communication stations.

RADIO TEST CARS

The division now has in service six radio test cars, one assigned to each of the following districts: Third, Baltimore; fourth, Atlanta; fifth, Dallas; sixth, San Francisco; eighth, Detroit; ninth, Kansas City. Two additional cars are urgently needed for the first district, Boston, and the seventh district, Seattle. Since the first car was purchased in 1925 the usefulness of these cars in our inspection work has been fully demonstrated. There has been no other way found to satisfactorily transport the inspection equipment and efficiently perform much of the inspection work. The cars provide a practical and satisfactory means of checking the frequency of the numerous small stations sharing the same frequencies. This can not be done from the headquarters offices when several stations are simultaneously using the same frequency. The cars also provide the only means of measuring the field strength of radio transmitters and determining the dependable service area of stations. The strength of harmonics is also measured in this manner.

MONITORING BROADCASTING STATIONS

With apparatus constructed by the field inspection service, monitoring was carried on throughout the year in all inspection districts. The use of this equipment demonstrated the need for more precise instruments, and steps have been taken to procure them. It also proved the value of frequency measurements at fixed points rather than at the station being measured as was formerly the custom. This service has been of value to the Federal Radio Commission and has been helpful to station owners. Of the 614 licensed broadcasting stations, frequency measurements were made of 374 stations. The 240 stations not measured were mostly of low power, at a considerable distance from the monitoring stations, and stations operating simultaneously on shared frequencies, or operating mostly during daylight hours. To measure the frequencies of these stations it will be necessary to make use of test cars fitted with frequency-measuring apparatus, which will be possible during the coming winter when the apparatus now being manufactured for this purpose has been installed. Fixed-point measurements will be made at Boston, New York, Baltimore, New Orleans, Los Angeles, San Francisco, Portland, Detroit, Chicago, St. Paul, Denver, and Grand Island, Nebr. At the latter point the constant-frequency monitoring station will be situated. In addition to monitoring the commercial and private stations, our service will monitor the Government stations of any department of the Government desiring our assistance. When these monitoring stations are fully equipped and manned the measurements will not be limited to broadcast stations as heretofore, but will include the frequencies in use above and below the broadcast band. During the year there were 2,451 measurements made showing a deviation of

500 cycles or more from the assigned frequency of the stations out of a total of 22,450 measurements made of broadcasting station frequencies. There were 106 measurements showing deviations of 5 kilocycles or more, and of this number there were 59 deviations of 10 kilocycles or more.

CONSTANT-FREQUENCY MONITORING STATION

The department was authorized in an act approved February 21, 1929, to purchase a suitable site and to contract for the construction thereon of a building suitable for installation therein of apparatus for use as a constant-frequency monitoring radio station, and for the construction of a suitable roadway, power, and communication facilities, at a cost not to exceed $50,000.

The site, comprising 50 acres of land, has been procured in the vicinity of Grand Island, Nebr., which is about the geographical center of the United States, where tests indicate radio-reception conditions to be favorable in all directions. The chamber of commerce at Grand Island has shown a real and helpful interest in our problem from the beginning of our effort to find a suitable site and is continuing its cooperation to the fullest extent.

The Navy Department, Bureau of Yards and Docks, prepared plans and specifications for the building and is continuing to give such assistance and advice as are needed in connection with the work.

It is expected that the building will be erected and the apparatus installed and in operation within a few months. The measuring apparatus to be installed in this station will be of such design that it will be capable of making measurements with a resulting accuracy of 1 part in 1,000,000. The primary source of frequency will be that of the earth's rotation derived through the United States standard of time, which is the Naval Observatory at Washington, from which standard time is transmitted twice daily. To further augment these standard time transmissions there will be installed at the constant-frequency station a master clock, operating in a heat-controlled chamber and under vacuum, accurate to a degree greater than one-tenth of a second. This method assures agreement with the recognized radio standard of the United States at the Bureau of Standards. This standard clock will be checked daily and kept in synchronism with the Naval Observatory clock.

An electrically driven tuning fork, controlled by the clock, serves as a basis for the establishment of the ultimate radio-frequencies to be developed. As an alternate, a piezoelectric oscillator will be supplied to perform the same service as the tuning fork. The frequency of the tuning fork which is relatively low, on the order of 5,000 cycles, is multiplied by means of harmonic multiplier circuits to radio-frequencies on the order of 30,000 kilocycles. The production of these radio-frequencies is accomplished in such a manner that harmonics are available at every 10 kilocycles throughout the radio-frequency spectrum. These standard frequencies are used as a means of measurement of unknown radio-frequencies in precisely the same fashion as described in the operation of the secondary standards of frequency. The equipment involved in all operations is of a more precise nature due to the greater requirements of accuracy for this central station.

Three types of receivers are to be installed at this station, two of which cover the frequencies from 100 to 30,000 kilocycles; the third covers from 10 to 100 kilocycles, using both loops and antenna and having extreme selectivity and sensitivity. The arrangement of the receivers permits simultaneous use at all times. Each receiver is to be in a shielded booth. All power supplies, although generated on the premises, are to be filtered and shielded. The standards and receivers will be operated entirely from storage batteries, all provided in duplicate, and charged by means of small motor generators through suitable distribution systems connected to the main power plant.

A special antenna system, in conformity with the latest developments in this line, is to be erected. These antennæ are in the main to be of the type connected to receivers through radio-frequency transmission lines. Due to the large number of these antennæ and to the necessity of complete isolation from any device capable of causing interference with reception it has been necessary to secure at least 50 acres of land for the use of this station.

The station is to be built around a room having 2,000 square feet of floor space in which will be installed all of the standard equipment and receivers. In addition to this large room there will be rooms to be used for dormitories, kitchen, workshop, office, storage batteries, motor generators, and switchboards. An adjacent building will provide garage space and power plant. Every effort has been made to make the station complete in itself, so that 24-hour-a-day service will be insured throughout the year.

SECONDARY STANDARD OF FREQUENCY MONITORING

The secondary standards of frequency now being developed for the division obtain their fundamental source of frequency from a piezocrystal with temperature carefully controlled. This crystal is electrically connected with the 10-kilocycle oscillator and controls it. The 10-kilocycle oscillator is a device rich in harmonics, furnishing them every 10 kilocycles between the limits of 30,000 and 10 kilocycles. Since these numerous frequencies are furnished by an oscillator controlled by the crystal oscillator their accuracy is supposed to be of the same order as that of the fundamental control frequency.

The beat frequency indicator is a device which furnishes indication in a visual form between various circuits and is primarily a resonance indicator capable of use to a great accuracy.

The audio-frequency oscillator operates between the frequencies of approximately 60 and 15,000 cycles. Its use is the accurate determination of the difference between unknown frequencies such as those of the transmitting stations to be measured and the known frequencies supplied from the control oscillator.

The heterodyne frequency wave meter is an oscillating wave meter which is used for the identification of individual 10-kilocycle harmonics. It is a device having fundamentally a straight line curve permitting the standard frequency identifications to be made quickly and accurately.

The tuning-fork calibration meter furnishes a means of either calibrating or determining the state of calibration of the audio-frequency oscillator. It is really a device supplying a sufficient number of known accurate audio-frequencies by means of which the calibration curve or the audio oscillator may be either drawn or checked.

The above equipment is to be used for the measurement of frequency of any radio transmitter in the following manner: Signals are tuned in from the transmitter on the proper receiver, a description of which follows later, and are put through the following operations: The output from the receiver is heterodyned or mixed with the output of the 10-kilocycle controlled oscillator. Since this oscillator has harmonics all through the radio-frequency spectrum, one of these harmonics will beat with the output of the receiver producing an audio-frequency whose value is dependent on the difference or sum between the transmitter's frequency and the proper harmonic. The order or value of this harmonic may then be determined by means of the heterodyne frequency meter. The beat frequency produced between the harmonic of the 10-kilocycle oscillator and the transmitter may then be measured by means of the audio-frequency oscillator. This amounts to merely varying the frequency of the audio oscillator until its frequency is exactly the same as that of the beat frequency mentioned above. We now know exactly the difference between the standard frequency and the transmitter frequency. Inasmuch as the transmitter frequency may be either above or below the standard beating harmonic from the 10-kilocycle generator, it is necessary to either add or substract this difference from this harmonic. Whether it should be added or subtracted is determined by the use of the heterodyne frequency meter which is heterodyned with the incoming signal, and since it was previously heterodyned with the beating harmonic a glance at the curve of the instrument will indicate which way the transmitter frequency lies. In all of these operations each zero beat, whether between audio or radio frequencies, has been determined by means of the zero beat indicator furnishing visual indication, and also by means of a loud speaker furnishing audible indications. A brief summation of the operations outlined above would be that, to measure an unknown frequency, the unknown frequency is heterodyned with a standard known frequency. The difference between the known frequency and the unknown or transmitted frequency is measured by means of an audio oscillator exactly synchronized with the difference between the two.

The receivers to be used at the secondary standard stations consist of two units, one operating between the frequencies of 1,500 and 100 kilocycles, the other operating between the frequencies of 1,500 and 30,000 kilocycles. The receiver mentioned first consists of four stages of individually tuned radio-frequency amplification. Plug-in coils are used to cover the wide range. The selectivity of this receiver is such that it is possible to receive without interference stations on each of the 10-kilocycle channels throughout the broadcast band. The sensitivity of the receiver is such that it will respond to signals of less than 1 microvolt per meter level and furnish a good loud-speaker signal at this value. The audio-frequency section of the receiver furnishes reproduction throughout the entire audio range of frequencies up to 10,000 cycles and works in to a special dynamic type of loud speaker giving high-quality reproduction. Regeneration in the detector circuit of this receiver is supplied to further increase the sensitivity of the set and to make possible the reception of continuous wave signals. This receiver operates from both loops and antenna throughout its range.

The high-frequency receiver which operates over the range of 1,500 to 30,000 kilocycles is a radio-frequency receiver having three stages of screen grid individually tuned amplification. This receiver is an extremely selective and sensitive device, furnishing loud-speaker response on radio signals of a level considerably less than 1 microvolt per meter. Regeneration is supplied in this receiver to increase its sensitivity and to make possible the reception of continuous wave signals. The audio-frequency portion of the receiver as well as its loud speaker is identical with that described above.

The power supply for the secondary standard of frequency, its associated equipment, and the receivers as outlined above, is derived entirely from storage batteries. All batteries are supplied in duplicate both for filament and plate supply. These batteries are kept in a state of charge by means of two high-voltage motor generators and one low-voltage motor generator. All charging and discharging are done through a switchboard which furnishes indications of the various rates of charge and discharge at all times.

The total secondary standard of frequency, as described above, is a complete unit for the reception and measurement of any frequency between 100 and 30,000 kilocycles. The accuracy of measurement is such that a result of at least 1 part in 100,000 may be secured.

These secondary standards are to be placed in each of the radio inspection districts. Six of them will be placed on the six test cars now in service. They will supplement the service to be performed at the central station situated in Nebraska.

RADIO FOR AVIATION

There are now 97 planes equipped with radio apparatus. Radio transmitting licenses have been issued to 34 airports; in addition there have been issued 44 construction permits for airports to be equipped with radio transmitters. From the radio standpoint, this service is just getting started and is expected to expand rapidly.

Following are some pertinent extracts from a report submitted by a commercial aviation committee on radio:

> It is anticipated that the safeguarding of life and property in aviation will be largely dependent upon radio communication, radio navigation, advising pilots regarding weather conditions, directing pilots to landing fields, guiding pilots during periods of poor visibility, and enabling pilots to land. Due to the nature of the service rendered, radio is the only means for handling communications to and from aircraft in flight. At present in the United States there are approximately 3,000 landing fields in operation or under construction and about 20,000 planes of all classes in use. Several overseas aircraft routes are projected.

Radio stations in this important and rapidly developing service must be inspected and protected from interference. Safety of life and property is largely dependent upon reliable radio communication, and the inspection service of the radio division will be relied upon to aid in protecting this service from interference. The personnel and facilities of the radio division are far from being adequate to meet the demands being made upon it. It is essential that increased facilities be made available through larger appropriations for this service;

otherwise its duties can not be performed as they should be, even though the personnel continue working overtime in the future as they have in the past.

RADIOBEACONS AND RADIO COMPASSES

For the purpose of better safeguarding navigation, particularly in foggy weather, when the greatest need for aid exists, the Bureau of Lighthouses has in operation 23 radiobeacons on the Atlantic coast, 15 on the Pacific coast, 6 on the Gulf coast, and 21 on the coasts of the Great Lakes. These beacons are located in the lighthouses and light vessels. The transmitters send out characteristic signals composed of dashes and dots which serve to identify each beacon. This service is available to ships which are equipped with radio compasses. In other countries there are a total of 57 beacons.

Interest in the installation of radio compasses on ships is increasing rapidly. Because of the value of this apparatus as a navigational aid and its demonstrated usefulness in connection with locating vessels in distress it was agreed at the Safety of Life at Sea Conference held in London in April and May of this year that all passenger ships of 5,000 tons gross tonnage and upwards shall within two years from the date on which the convention comes in force be provided with an approved direction finding apparatus (radio compass).

Under the United States flag there are 718 commercial vessels and 375 Government vessels using radio compasses or a total of 1,093. There are 1,942 foreign vessels so equipped.

AUTOMATIC ALARM SIGNAL DEVICE

The Safety of Life at Sea Convention signed at London May 31 provides for the use of the auto alarm as a means of maintaining watch. This device may be used as a substitute for an operator or a watcher where more than one operator is required on a vessel. However, all vessels which are required to be fitted with radio installations, shall, for safety purposes, carry a qualified operator. Where the auto alarm is installed it must be in operation whenever the operator or watcher is not on duty. The auto alarm must meet the specifications set forth in the International Radiotelegraph Convention of Washington, 1927. There are 5 types of auto alarm being manufactured—3 British, 1 French, and 1 German. So far, only the British types are installed on ships and all are on British ships, with few, if any, exceptions. During the fiscal year, 688 inspections were made of vessels equipped with auto alarms and in 414 cases reports were made that the device had responded to signals not intended to actuate the apparatus.

RADIO BROADCASTING

The United States was the first country in the world to have radio broadcasting. The first broadcasting licenses were issued in the fall of 1921. Prior to this time a few special events were broadcast, but this form of transmission was carried on largely for the purpose of testing radiotelephone transmitters, which was usually done under experimental licenses. One of the earliest radiotelephone tests of which this office has a record, in connection with which phonograph records of music were broadcast, was carried on by the Wanamaker, New York, radio station during May, 1914. Different types of hydrogen arc radiotelephone transmitters were used in these tests. Government departments, commercial radio companies, and amateurs were about the only ones having radio receiving sets at that time. One of these sets was installed in the office of the radio inspector, customhouse, New York, for the purpose of observing interference between amateur stations and ships. While engaged in this work the broadcast of music was detected. No one at that time had any idea of the future possibilities of broadcasting entertainment. About five years later experiments were being made with the tube type of radio transmitter. Listeners hearing the musical programs, and learning the source of them, sent in requests for more music which subsequently resulted in the inauguration of the service through stations built for this purpose. During the early days the programs of a majority of the stations consisted almost entirely of phonograph records. The announcers usually had favorite records which they repeated numerous times during a program.

The Secretary of Commerce foresaw the danger of the stations losing public interest if a change was not made in the programs. He ordered the creation of a new class of license requiring a higher standard in equipment, studios, and programs which immediately stimulated interest in the programs and resulted in rivalry among station owners to improve their stations and obtain one of the new high-class licenses. Thus was the foundation laid for the high-class broadcasting service we have to-day, which is far in advance of any country of the world as indicated by the increase in the number of receiving sets in use, approzimately 60,000 in 1922 and approximately 10,000,000 at the present time. When an event of general public interest is broadcast it is reasonable to assume that it is available to more than half of the population of this country and a large number in other countries of the world.

From the beginning it has been recognized that the basis of granting a broadcasting license should be service to the public, and in no other way can an audience be held or a station prosper. There is no financial support for the operation of broadcasting stations derived directly from the listeners through the payment of a fee, such as is the custom in many other countries. For instance, in Great Britain there is an annual tax on the use of receiving sets amounting to $2.45. In France the rate is 5 cents per annum and in Salvador it is $18 per annum. Canada charges $1 per annum.

AMATEURS

At the end of the fiscal year there were 16,829 licensed amateur radio stations, a decrease of 99 as compared with the previous year, when there were 16,928. While other countries are worrying over the problem of controlling, taxing, and discouraging the few surviving amateurs they have, this country is constantly endeavoring to keep this large and useful group of experimenters engaged in useful and interesting work. The latest proposal they have put forward is a request for permission to carry on radiotelephone communication in the 20-meter band, from 14,000 to 14,400 kilocycles. If given this privilege, the amateurs expect to carry on international radiotelephone communication in this high-frequency band.

In order to continue satisfactory operation under the restricted frequency bands imposed by the Washington convention, intensive technical development has been carried on by the amateurs during the past year. This, the American Radio Relay League reports, has resulted in marked advances in apparatus and methods. In March, 1928, the band 28,000 to 30,000 kilocycles, 10.7 to 10 meters, made available to amateurs in the Washington convention, was opened to their use in this country. They have given particular attention to work in this band, and two-way communication has been established between amateurs in this country and in Europe, South America, and New Zealand. European amateurs have succeeded in communicating from Europe to South Africa and India on similar frequencies. On their more useful frequencies, numerous amateur stations have now been in communication with as many as 50 foreign countries. There is an increase in amateur interest in radiotelephony and many amateurs now seek an opportunity to duplicate by voice the long-distance work which they have successfully accomplished by radiotelegraphy.

The amateur again demonstrated his great value as a means of emergency communication to storm-stricken communities during the West Indian hurricane in September, 1928. At the Virgin Islands, when the Navy station was destroyed, one of the operators who maintained an amateur station put his set on the air and broadcast a warning to the United States in advance of the disturbance. As a result, amateurs in Florida and other Southern States had established emergency communication routes before the storm had reached this continent. Particular credit is due to two amateurs at Palm Beach who, although they lost their homes and personal belongings, put their amateur set into operation and for three days furnished the only means of communication with northern points from the distressed area. State, Army, and municipal authorities were high in their praise of this service.

In addition to emergency work, amateurs afforded home contact with many exploring and scientific expeditions.

INTERNATIONAL RADIO COMMUNICATION

Radiotelegraph and radiotelephone circuits now link the United States with the principal countries of the world. This service is being constantly improved and extended. Already it is far more extensive than that of any other nation. Much of this expansion and improvement are due to the successful use of short waves (high frequencies). Handling of increased traffic has been made possible by the development of directive, high-speed, short-wave apparatus.

In addition to the trans-Atlantic radiotelephone service, made available to the public January, 1927, there is soon to be inaugurated radiotelephone service between ship and shore and ship and ship. It is planned to provide a method for direct conversation between the residence or office phone and the stateroom phone on the ship.

PERSONNEL

The division is experiencing much difficulty in obtaining employees in the inspection service having the essential qualifications considered necessary for the performance of the highly technical duties required of this service. There are 18 vacancies to be filled. The Civil Service Commission held a special examination throughout the United States on January 15, 1929, which resulted in obtaining 14 eligibles from a total of 44 who took the examination for the position of assistant radio inspector. Only three of these men were willing to accept appointment. The Civil Service Commission has authorized the filling of existing vacancies by temporary appointments pending the establishment of another list of eligibles. Commercial companies are employing men with similar qualifications and are offering better salaries. The supply is not equal to the demand in this highly technical and specialized field, therefore our service will be at a disadvantage until the salaries more nearly compare with commercial salaries.

I renew my previous recommendation that the following classification of positions and salaries be made applicable to the field-inspection personnel:

Supervisor (senior)	$5, 600–$6, 400
Supervisor (junior)	4, 600– 5, 200
Assistant supervisors	3, 800– 4, 400
Inspectors	3, 200– 3, 700
Assistant inspectors	2, 600– 3, 100

A true indication of the need for additional personnel is shown by the number of hours overtime worked by 56 inspectors, which was 601 days during the year, and the amount of annual leave these men were able to take, which was 686 days during the year—average overtime per man 10⅘ days, average leave per man 12¼ days. The above annual leave was not given to compensate for overtime, but ordinary leave granted all employees.

INTERNATIONAL CONFERENCES

A representative of the radio division attended three international conferences during the year. The first one was held at Ottawa, Canada, in January, where arrangements were made by representatives of Canada, Cuba, Newfoundland, and the United States to use certain short waves or high-frequency channels for national services in such manner as to avoid international interference. Mexico was invited to send a representative, but it was not convenient for him to attend at the time arranged. However, the requirements of Mexico were given careful consideration and a share of the waves was provided for the use of Mexico.

The second conference was held at Prague, Czechoslovakia, in April. This conference limited its deliberations almost entirely to subjects affecting European broadcasting and particularly to a new plan of frequency assignments for European broadcasting stations. Several other subjects of technical character were discussed, but as they were of international interest it was decided that they be referred to the international technical consulting committee on radio created by the International Radiotelegraph Convention of Washington, 1927. This technical committee will hold its first meeting at The Hague in September, 1929.

The third conference was held at London, beginning April 16 and closing May 31. This conference dealt with subjects relating to safety of life at sea, an important one of which is radio. As a result of this conference the number of vessels required to be equipped with radio is materially increased. Passenger ships of 5,000 gross tonnage and upwards, if engaged in international service, must be fitted with radio direction-finding apparatus (radio compass). Where ships in the international service carry more than 13 lifeboats, 1 shall be a motor boat, and where the number is more than 19, 2 shall be motor boats. These motor lifeboats shall be fitted with a wireless telegraph installation. The radiotelegraphy provisions of the convention apply to all ships engaged in international voyages except cargo ships of less than 1,600 tons gross tonnage. All ships covered by the convention must carry at least one licensed operator, but continuous watch may be maintained by the use of an automatic alarm, provided such device complies with the requirements specified in the International Radiotelegraph Convention of Washington, 1927.

INTERNATIONAL RADIO ACCOUNTING

Since July 1, 1924, it has fallen to the lot of the radio division to carry out the provisions of the London Radiotelegraph Convention of 1912, to which the United States is signatory, with reference to settlement of accounts for tolls arising from the exchange of radio traffic between vessels of American registry and foreign coastal and ship stations. Messages originating in the United States and addressed to vessels of any nationality via radio are also charged to the United States by foreign administrations. Collections and settlements therefor are made through the accounting section of the radio division.

The activities of the accounting section of the radio division during the fiscal year from July 1, 1928, to June 30, 1929, may be summarized as follows:

Number of accounts handled:	
On hand July 1, 1928	701
Received during year	1, 100
Total	1, 801
Settled and cleared	1, 045
Accounts on hand and unsettled June 30, 1929	756
Financial operations required to complete activities summarized:	
Cash balance, July 1, 1928	$61, 863. 31
Collections	62, 773. 74
Total	124, 637. 05
Disbursements	80, 117. 24
Cash balance, June 30, 1929	44, 519. 81

Efforts of the nations signatory to the London Radiotelegraph Convention of 1912 have been directed in late years toward expediting settlement of accounts of the classes described. Special efforts have been made by the accounting section of the radio division to keep the accounts constantly moving in order that they may be held only long enough to permit collection of charges due by American companies to foreign administrations. The cash handled represents collections only, as no appropriation account is involved in any way. The speed with which accounts may be settled with foreign administrations depends only on the completion of collections from American companies, inasmuch as no single account may be disbursed until all charges are collected. The cash balance at the end of each fiscal year represents partially collected charges on unsettled accounts.

Very truly yours,

W. D. TERRELL,
Chief Radio Division.

STATISTICAL TABLES

Submitted below are statistics covering the division's work.

SCOPE OF WORK

The following table shows the inspection and licensing work performed yearly from 1914 to 1929, inclusive, and the number of persons employed in the field force:

June 30—	American ships	American ships licensed	Inspections of American and foreign ships	Commercial operators licensed	Commercial and special land stations licensed [1]	Amateur stations licensed	Amateur operators licensed	Total field force
1914	555	203	6,484	339	83	2,137	1,172	20
1915	585	362	6,152	1,653	115	3,547	3,067	25
1916	604	444	7,236	1,278	182	4,942	4,199	28
1917	836	484	7,137	1,682	160	3,741	3,303	28
1918	1,478	392	5,575	1,616	------	------	------	29
1919	2,312	976	5,160	1,645	------		------	27
1920	2,808	1,158	5,419	4,652	254	5,719	6,103	25–45
1921	2,978	921	5,591	2,722	491	7,351	6,207	26
1922	2,773	1,174	6,071	3,136	1,086	9,525	8,920	35
1923	2,723	945	6,933	2,860	1,375	7,821	9,908	53
1924	2,741	1,382	7,727	3,370	1,489	8,205	9,545	53
1925	1,901	976	8,603	3,215	1,129	10,074	8,293	62
1926	1,954	1,258	9,197	3,398	1,072	8,037	8,140	65
1927	2,092	[1] 558	9,330	3,463	1,260	7,123	7,275	63
1928	2,166	(2)	9,093	3,816	(2)	12,386	8,369	78
1929	2,213	(2)	10,715	3,798	(2)	12,646	9,490	95

[1] Includes experimental, relay broadcasting, visual (television) broadcasting, and technical and training school stations.

[2] Radio station licenses, other than amateur and technical and training school station licenses, were issued by the Federal Radio Commission during the fiscal years 1928 and 1929.

DETAILED WORK OF THE RADIO SERVICE

The following statement shows the details of the work performed during the past fiscal year compared with 1928 and the total number of licensed and Government radio stations:

Work of service	1928	1929
Clearances of American and foreign vessels required by law to be equipped with radio	14,305	15,023
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	9,093	10,715
Inspections of radio equipment on voluntarily equipped vessels	1,659	2,520
American ship radio stations inspected for license	1,139	1,102
Land stations inspected	866	1,154
Land stations inspected for license	12	29
Amateur stations licensed	12,386	12,646
Commercial operators examined	2,953	3,477
Commercial operators licensed	3,816	3,798
Amateur operators examined	5,687	3,173
Amateur operators licensed	8,369	9,490
Defects found upon inspection of ship radio stations where clearance would have been in violation of law	235	335
Licensed and Government radio stations: [1]		
American vessels equipped with radio	2,166	2,213
Experimental, relay broadcasting, visual broadcasting, and technical and training-school stations	234	228
Commercial land stations [2]	342	446
Broadcasting stations	691	614
Commercial aircraft stations	5	97
Geophysical stations [2]	------	106
Amateur stations	16,928	16,829
Government land stations	[3] 400	[4] 369
Government ship stations	1,216	1,211

[1] Stations in the Philippine Islands are not included.

[2] A number of stations for which construction permits have been issued but not licensed for operation up to June 30, 1929, are not included in these figures.

[3] Includes 56 radiobeacons and 53 radio-compass stations.

[4] 65 radiobeacons and 53 radio-compass stations not included.

OPERATORS LICENSED

The following table shows the number of radio operators licensed during the past two years:

Class and grade	1928	1929	Total
Commercial extra first class	17	19	36
Commercial first class	3,088	2,080	5,168
Commercial second class	711	1,471	2,182
Broadcast class	(1)	113	113
Phone class	(1)	115	115
Amateur extra first grade	(2)	72	72
Amateur first grade	4,424	5,058	9,482
Amateur (temporary)	[2] 3,945	[3] 4,360	8,305
Total	12,185	13,288	25,473

[1] Established in 1929.

[2] Discontinued in 1928; reestablished in 1929.

[3] Amateur second grade discontinued in 1928; temporary class established in 1929.

MONITORING

The following table shows the monitoring work performed by districts:

District	Stations monitored		Measurements made		Measurements showing deviation of 500 cycles or more	
	In district	Outside district	In district	Outside district	In district	Outside district
First	25	83	1,452	1,054	109	75
Second	45	97	4,292	769	603	154
Third	25	134	322	285	15	6
Fourth	55	55	99	70	23	5
Fifth	18	61	295	307	96	53
Sixth	47	50	4,561	457	417	33
Seventh	23	39	2,724	1,164	287	140
Eighth	51	81	1,387	1,049	166	108
Ninth	75	59	1,582	581	105	56
Total	364	659	16,714	5,736	1,821	630

FIELD ACTIVITIES

Following is a statement, by districts, of the work performed during the past fiscal year compared with the previous year:

Place of inspection or examination (city or town)	Stations inspected						Amateur stations licensed	Operators examined						Operators licensed						
								Commercial				Amateur		Commercial				Amateur		
	Ship, under act	Ship, voluntary equipment	Ship for license	Land [1]	Land for license [1]	Amateur		Extra, first	First	Second	Broadcast and phone	Extra, first [2]	First [3]	Extra, first	First	Second	Broadcast and phone	Extra, first	First	Temporary [4]
First district:																				
Boston, Mass.	1,313	74	56	2		4	1,465	3	159	70	11	11	119	3	145	112	11	6	506	311
Outside Boston office		1	1	12		40						2	197					2	98	
Total, 1929	1,313	75	57	14		44	1,465	3	159	70	11	13	316	3	145	112	11	8	604	311
Total, 1928	1,221	81	65	55		12	1,181		259	35			364	1	257	62			638	327
Second district:																				
New York, N. Y.	2,516	367	351	4	1	21	1,397	3	418	158	16	10	374	5	533	221	14	7	607	60
Outside New York office	297	91	88	1																
Total, 1929	3,813	458	439	5	1	21	1,397	3	418	158	16	10	374	5	533	221	14	7	607	60
Total, 1928	3,218	567	583	32	4	52	1,189	3	458	89			460	10	747	60			604	48
Third district:																				
Baltimore, Md.	439	43	17			2	1,138		49	21	1		30		77	36	1		324	93
Outside Baltimore office				5		2							17							
Philadelphia, Pa.	462	7	6	11		12			55	27	9	8	123		69	42	6	4	86	
Outside Philadelphia office	1	7	5	1		3						3								
Norfolk, Va.	637	22	20	2		1			20	9	4		29		29	12	5		34	
Outside Norfolk, office		1	1	1	1															
Washington, D. C.				1				1	43	22	6	2	34	4	39	27	5	2	34	
Total, 1929	1,539	80	49	21	1	20	1,138	1	167	79	20	13	233	4	214	117	17	6	478	93
Total, 1928	1,508	68	58	42	6	15	1,121		145	47			189		273	64			488	79
Fourth district:																				
Atlanta, Ga.							659		18	12	16	3	16		43	35	17	9	112	320
Outside Atlanta office	46	4		41					17	26	12	7	68							
Total, 1929	46	4		41			659		35	38	28	10	84		43	35	17	9	112	320
Total, 1928	2			20			622		74	35			198		86	23			69	191

[1] Other than amateur.
[2] Revived in 1928.
[3] Totals for 1928 include first and second class, second class having been discontinued in 1929.
[4] Totals for 1928 are for second class which was discontinued in 1929.

Place of inspection or examination (city or town)	Stations inspected						Amateur stations licensed	Operators examined						Operators licensed						
								Commercial				Amateur		Commercial				Amateur		
	Ship, under act	Ship, voluntary equipment	Ship for license	Land	Land for license	Amateur		Extra, first	First	Second	Broadcast and phone	Extra, first	First	Extra, first	First	Second	Broadcast and phone	Extra, first	First	Temporary
Fifth district:																				
New Orleans	583	132	101	13			832		165	75	5		23	1	281	208	23	5	179	475
Outside New Orleans office	16	51	41	162	2	29			80	123	37	7	129							
Total, 1929	599	183	142	175	2	29	832		245	198	42	7	152	1	281	208	23	5	179	475
Total, 1928	642	108	109	192		25	903		246	96			557	1	431	91			204	463
Sixth district:																				
San Francisco, Calif	1,317	370	125	11	2		881		204	89	13	12	209	5	380	177	20	14	942	370
Outside San Francisco office		5	2	67		1			49	11	6	18	123							
Los Angeles, Calif				10		1		2	39	44	6	3	81		36	63	12	5	105	
Outside Los Angeles office	213	62	32	37	1				3	9	10	2	14							
Total, 1929	1,530	437	150	125	3	2	881	2	295	153	35	35	427	5	416	240	32	19	1,047	370
Total, 1928	1,317	255	183	157		15	1,011	2	399	92			710	4	598	87			1,036	277
Seventh district:																				
Seattle, Wash	564	224	53	36	2	3	940		113	94	6	1	72		167	150	24	2	331	230
Outside Seattle office	15	16	6	108	10	5			55	73	13	4	160							
Total, 1929	579	240	59	144	12	8	940		168	167	19	5	232		167	150	24	2	331	230
Total, 1928	612	216	105	83	1	29	893		186	126			282		263	93			208	137
Eighth district:																				
Detroit, Mich	461	317	29	14	2	1	1,887		82	73	38	5	90	1	86	116	33	5	452	1,036
Outside Detroit office				26		4			12	27	5	15	218							
Buffalo, N. Y	155	249	15	91	1	4	89		16	23	12	3	32		24	31	5	4	102	22
Outside Buffalo office				25	3	17			8	4			80							
Total, 1929	616	566	44	156	6	26	1,976		118	127	55	23	420	1	110	147	38	9	554	1,058
Total, 1928	277	289	27	91		11	2,281		152	25			1,104	1	179	57			498	929

Ninth district:																				
Chicago, Ill	648	158	25	37	2	8	3,358	1	143	166	20	2	174		158	200	42	6	985	1,443
Outside Chicago office		10	7	222		26			88	81	28	13	438							
St. Paul, Minn									5	13	1		29		1	8	1		35	
Outside St. Paul office		1		104		34				1		3	19							
Duluth, Minn	32	172	52	24	2	4			9	12	1		14		7	5			15	
Outside Duluth office		136	69	11																
Kansas City, Mo				35		2			4	20	11	2	38		5	28	9	1	111	
Outside Kansas City office				40		5			3	21	19	4	83							
Total, 1929	680	477	153	473	4	79	3,358	1	252	314	80	24	795		171	241	52	7	1,146	1,443
Total, 1928	296	75	9	185	1	25	3,185	1	369	144			1,823		254	174			679	1,550
SUMMARY																				
First district	1,313	75	57	14		44	1,465	3	159	70	11	13	316	3	145	112	11	8	604	311
Second district	3,813	458	439	5	1	21	1,397	3	418	158	16	10	374	5	533	221	14	7	607	60
Third district	1,539	80	49	21	1	20	1,138	1	167	79	20	13	233	4	214	117	17	6	478	93
Fourth district	46	4		41			659		35	38	28	10	84		43	35	17	9	112	320
Fifth district	599	183	142	175	2	29	832		245	198	42	7	152	1	281	208	23	5	179	475
Sixth district	1,530	437	159	125	3	2	881	2	295	153	35	35	427	5	416	240	32	19	1,047	370
Seventh district	579	240	59	144	12	8	940		168	167	19	5	232		167	150	24	2	331	230
Eighth district	616	566	44	156	6	26	1,976		118	127	55	23	420	1	110	147	38	9	554	1,058
Ninth district	680	477	153	473	4	79	3,358	1	252	314	80	24	795		171	241	52	7	1,146	1,443
Grand total, 1929	10,715	2,520	1,102	1,154	29	229	12,646	10	1,857	1,304	306	140	3,033	19	2,080	1,471	228	72	5,058	4,360
Grand total, 1928	9,093	1,659	1,139	866	12	184	12,386	6	2,288	689			5,687	17	3,088	711			4,424	3,945

COST OF RADIO SERVICE

The following statement shows the detailed expenditures of the radio service for 1929 and the appropriation and proposed allotment for the fiscal year 1930.

	1929	1930
Salaries:		
District of Columbia	$52, 103. 84	$85, 770. 00
Field	213, 932. 46	297, 180. 00
Total	266, 036. 30	382, 950. 00
General expenses:		
Travel and subsistence	18, 380. 26	17, 420. 00
Furniture and fixtures, office	8, 753. 66	3, 800. 00
Test cars and equipment	19, 955. 12	6, 800. 00
Motor vehicles	749. 19	
Technical instruments and supplies	108, 498. 66	13, 200. 00
General expenses—Con.		
Rents	$16, 473. 48	$25, 800. 00
Office supplies and stationery	2, 859. 98	3, 675. 00
Communications	2, 735. 61	3, 500. 00
Miscellaneous expenses	2, 138. 97	2, 855. 00
Total	[1] 446, 581. 23	[2] 460, 000. 00
Unexpended balance	29, 578. 77	
Total appropriations	476, 160. 00	460, 000. 00

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[1] The total amount appropriated for the fiscal year 1929 was $476,160. This was made as follows: The regular appropriation, $320,000; second deficiency act, $140,000; and supplemental appropriation to meet salary adjustments under the Welch Act, $16,160.

[2] In addition to the regular amount appropriated, $460,000, by act of Congress $50,000 was made available for the purchase of a site and for the construction of a constant-frequency monitoring radio station.

U. S. DEPARTMENT OF COMMERCE

R. P. LAMONT, Secretary

RADIO DIVISION

W. D. TERRELL, Chief

Selection from

ANNUAL REPORT

OF THE

CHIEF OF RADIO DIVISION

TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1930

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1930

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RADIO DIVISION

DEPARTMENT OF COMMERCE,
RADIO DIVISION,
Washington, July 1, 1930.

The honorable the SECRETARY OF COMMERCE.

DEAR MR. SECRETARY: In response to your request I furnish the following condensed report of the work of the radio division during the past fiscal year, including references to related developments which have taken place during that period.

LEGISLATION

In an act approved December 18, 1929, Congress extended the administrative control of the Federal Radio Commission over radio communication until such time as may otherwise be provided for by law.

Senate Joint Resolution 176 was introduced on May 12, 1930, providing for the transfer of the functions of the radio division of the Department of Commerce to the Federal Radio Commission. This resolution was passed by the Senate. A favorable report was made on the resolution by the Merchant Marine and Fisheries Committee of the House, but no further action has been taken on the measure.

House Joint Resolution 337 was introduced on May 19, 1930, and referred to the Committee on Merchant Marine and Fisheries. No report was made on the resolution by the committee. This resolution provided for the transfer of the functions of the radio division of the Department of Commerce to the Federal Radio Commission.

House bill 12948, transferring the functions of the Federal Radio Commission to the radio division of the Department of Commerce, was introduced June 13, 1930, and referred to the Committee on Merchant Marine and Fisheries.

On April 18, 1929, Senate bill 6 was introduced. This bill provides for the regulation of the transmission of intelligence by wire and wireless; the creation of a commission on communications to take over the present duties of the Federal Radio Commission, the radio division of the Department of Commerce, and related duties now under the jurisdiction of the Interstate Commerce Commission. This measure was referred to the Committee on Interstate Commerce, where extensive hearings were held. As a result of these hearings the provisions of this bill are now being revised.

RADIO INSPECTION SERVICE

Although greater demands are made upon this service each year and the surveys require more time because of the larger and more complicated radio installations on ships, the percentage of inspections as compared with clearances has not diminished. In 1926 there were 13,009 clearances and 9,197 inspections. In 1929 there were 15,023 clearances and 10,715 inspections. In 1930 there were 15,595 clearances and 11,334 inspections. As the radio installations on the ships included in the above figures are required by law as a safeguard against loss of life, a larger percentage of inspections should be made. The estimates for the 1932 appropriation will provide for the establishment of inspection offices at the following ports: Miami, Fla.; Savannah, Ga.; San Juan, P. R.; and Galveston, Tex., from which ports a considerable number of ships are clearing without inspection. During the last fiscal year new offices were established at Portland, Oreg., and Denver, Colo. It was planned to establish new offices in Hawaii and Alaska this year, but this may not be possible because of the increasing work at existing offices.

Of the 2,173 American vessels equipped with radio, only about 10 per cent of them come under the provisions of existing law, the remaining 90 per cent, which are voluntarily equipped, should receive more inspectional attention. Inspections developed 382 defects in the radio installations on ships during the year and these were remedied before the vessels departed. During the previous year there were 335 such defects reported.

Examinations were given 5,363 applicants for commercial operators' licenses and 3,993 applicants for amateur operators' licenses as compared with 3,477 commercial operators and 3,173 amateur operators during the previous year. There were 1,287 inspections made of ship stations for license as compared with 1,102 the previous year. Inspection of land stations during the past two years increased from 1,154 to 1,897. Inspections were made of 251 amateur stations as compared with 229 the previous year.

Undoubtedly more attention should be given to the inspection of broadcasting and other stations on land. Such inspections would develop much information of value to the Federal Radio Commission to guide it in determining its action on applications for renewal licenses, hearings, etc. Many of the unlicensed stations reported to be in operation would be discovered during these inspections, and other violations might be detected. This extension of activity will necessitate increased personnel. It is obviously not possible to accomplish this with the present force, which has worked 10,003 hours overtime during the past year.

During the year 1929, 1,075 inspection trips were made and 372 cities visited, while in 1930, 1,577 inspection trips were made and 534 cities visited.

RADIO TEST CARS

PURCHASE OF ADDITIONAL CARS

Orders have been placed for two additional test cars for use in the Boston and Seattle districts. When they are delivered each district, with the exception of New York, will be supplied with a test car. As a result, much radio-inspection work which would be impossible of accomplishment can be performed expeditiously and efficiently. Some years ago almost all of the radio-inspection work was centered around the large seaports. To-day it extends to every city of importance and many of the small towns throughout the country. This wide distribution of activity necessarily requires a larger force of inspectors, better traveling facilities, and transportation of more apparatus. The use of test cars materially aids in coping with the increasing demands made upon the division.

MOBILE STANDARDS ON RADIO TEST CARS

Owing to the large number of broadcast and other stations sharing channels of operation throughout the United States, very serious heterodyne interference is constantly experienced. With many stations operating on the same channel, it is obviously not possible to make measurements of frequency at remote points on any of these stations. In order to handle such a situation, the six radio test cars in service are being equipped with mobile secondary standards of frequency. The cars will travel continually through the districts, measuring the frequencies of the stations that are of low power and are on heterodyne channels. In this way it is hoped to reduce materially the interference experienced on national and regional channels in the broadcast band, and to make sure that stations remain within their assignment.

It is expected that all of the mobile units will have been installed and will be in operation by November 1.

FIELD-STRENGTH WORK

The radio test cars are equipped with field-strength measuring apparatus. During the past year there were a number of field-strength studies made on radio broadcast and other types of transmitting stations. These studies were made to determine the reliable service area about the station and whether the station was using the amount of power authorized by the Federal Radio Commission. With this apparatus it is possible to measure the power of a transmitter without going to the station to make an inspection.

During the past year a number of studies were made with the field-strength sets on the test cars to determine the ratio of signal strength between harmonics and the assigned fundamental frequency. Several such studies were made for Government agencies to determine whether the transmitting apparatus they were planning to purchase complied with the specifications covering the amount of permissible harmonic energy radiated.

It is believed that if the power of broadcast stations were assigned on the basis of field-strength studies considerable good would result, and in many cases the power of stations might be increased or reduced with beneficial results to the public. During the coming fiscal year it is planned to survey many of the broadcast stations and to make measurements of parasitic radiations which are known to be causing serious interference with high-frequency stations.

MONITORING BROADCASTING STATIONS

Monitoring work during the past year has been confined almost entirely to broadcasting stations. The apparatus in use, which was designed and built by men in the service, has a limited frequency range which does not extend much above or below the broadcasting band—550 to 1,500 kilocycles. During the year 45,695 frequency measurements were made. Of this number 44,923 were of broadcasting stations, 302 of stations other than broadcasting, and 470 of stations in foreign countries. The number of stations involved in these measurements were 380 broadcasting, 174 other than broadcasting, and 30 foreign stations. There were 1,020 measurements made showing deviations of 500 cycles or more from the frequency assigned to the stations. Of this number there were 344 measurements showing deviations from 1,000 cycles to 5,000 cycles, 16 measurements showing deviations from 5,000 cycles to 10,000 cycles, and 22 measurements showing 10,000 cycles or above. Last year 22,450 measurements were made and of this number there were 2,451 deviations of 500 cycles or more. This marked improvement in frequency stability is evidence of the efforts being made by station operators to improve the efficiency of their stations in this respect, together with the increased monitoring work done by the field force.

During the coming year the new monitoring apparatus will be in use. Then it will be possible to measure all the usable frequencies and a much greater number of stations. To get full benefit of this new apparatus and to meet the demands made for measurements of commercial and Government stations, a considerable increase in personnel is essential.

CONSTANT-FREQUENCY MONITORING STATION

For a number of years supervisors of radio have been seriously handicapped in the work of enforcing the radio-communication laws, and in many cases have been unable to carry out the requests of the Federal Radio Commission, due to the lack of proper apparatus, or due to the lack of apparatus capable of measuring the frequencies of transmitting stations with a high degree of accuracy. With the apparatus in use in the past there was always some doubt as to just what degree of accuracy of measurement was obtained, and it was difficult, if not impossible, for the various offices to check their measurements with one another. This condition led to a survey by the supervisor of radio at Detroit, Mich., of the methods used in making highly accurate frequency measurements. The views of many of the foremost radio engineers were obtained.

It was determined that the proper method to pursue in monitoring all classes of radio-transmitting stations in the United States and its possessions was to erect, somewhere in the approximate geographic center of the country, buildings in which to house the delicate frequency-measuring apparatus, and the sensitive radio receivers. It was essential that this site be well removed from manufacturing centers, telephone and telegraph lines, high-voltage transmission lines, and other possible sources of interference with reception. A site approximately 7 miles west of Grand Island, Nebr., comprising 50 acres of land in the form of a square, was finally obtained, without cost to the Government. The selection of this site was made only after careful investigation of reception conditions in the States of Kansas, Missouri, Nebraska, Iowa, and Illinois. At this location there is little or no man-made interference, and stations in foreign countries, as well as transmitting stations in continental United States, were regularly received without difficulty.

The 50-acre site selected is a quarter of a mile north of the Lincoln Highway, on level, sandy, prairie land. There are no telephone, telegraph, railroads, power lines, or residences within 3 miles of the site.

In addition to the two buildings it was necessary to install a sewage-disposal system, a water-supply system, and an electric-light plant. Fear was felt that through use of local power lines interference from devices operating on the power line many miles away would be conducted onto the reservation and picked up by the receivers. In investigating many of the complaints in 1927 it was found that inductive interference on high-voltage power lines was frequently carried 75 or 100 miles. With a local power plant and the placing of all power and telephone cables underground adequate protection against this type of interference is assured and the station is entirely independent of any outside source of power.

To be assured of 24-hour reception every month in the year special antennæ were constructed for the reception of all radio stations operating between the frequencies of 60,000 and 10 kilocycles. These special antennæ were necessary so that measurements could be made when static during the summer season was especially severe, and when, with an ordinary type of antennæ it would be impossible to do frequency-measuring work. Four antennæ of the multiple-doublet type were erected on the reservation and cover the high-frequency bands. This type of antenna is especially directive. They were so arranged that two of them point to London, England, for use in the reception of high-frequency stations in eastern United States and Europe, and two similar antennæ are pointed to Porto Allegro, South America, for the interception of high-frequency stations in southern United States, Central America, West Indies, and South America.

For the reception of broadcast stations and other services operating within the intermediate-frequency bands, a special antenna of the directive type, known as a "Beverage" was erected. This antenna points to New York City and is intended to receive broadcast and other stations in the United States. Later it is hoped that a similar type of antenna can be erected pointing in a westerly direction to San Francisco for the interception of broadcasting and other stations on the west coast. In addition to the antennæ just described, four single doublets, one vertical, and one general purpose antennæ were constructed for general all-around reception. It was not intended that they would have any highly directive properties. These antennæ are for the interception of high-frequency stations. For the interception of signals on frequencies between 200 and 10 kilocycles two large loops, at right angles, 250 feet long and 40 feet high, on a side, were erected. With this loop it is intended that reception of low-frequency stations throughout the United States and the world will be possible.

All antennæ referred to above are suspended on 60-foot cedar poles, and all—excepting the loop and general-purpose antennæ—are located a considerable distance from the buildings, out in the open. Signals are brought from these antennæ to receivers through long, 4-wire transmission lines which have been especially constructed with great care and precision.

Temporary power facilities in the form of three 2-kilowatt Kohler lighting plants were arranged for with the airways division of the Bureau of Lighthouses. With this temporary power equipment in position for service, it was possible to begin the installation of the radio receivers, storage batteries, standards of frequency, and other equipment. This work has been pressed as rapidly as possible, and the receiving equipment is now 80 per cent installed.

The apparatus installed consists of one standard of frequency having an accuracy of one part in a million, and one secondary standard having an accuracy of one part in a hundred thousand. In addition to these two standards there are, at the present time, a total of five receivers. Two of these receivers operate on a frequency of 30,000 to 1,500 kilocycles, two operate on frequencies from 1,500 to 100 kilocycles, and one receiver operates on frequencies from 100 to 10 kilocycles. With these receivers it will be possible to measure all of the usable radio frequencies in the spectrum.

During tests of the apparatus while being installed, over 300 broadcast stations were received, as well as a number of other services in continental United States. In addition to this, reception of stations in Chile, Canada, Cuba, Portugal, France, England, Philippine Islands, Hawaii, Argentine, Peru, Netherlands, Brazil, Panama, Costa Rica, Nova Scotia, Russia, and many other places in the world are regularly recorded.

The monitoring of stations operating on the frequencies which can be measured by this station will cover the following classes of service: Transoceanic; telegraph and telephone; marine, operating on high, low, and intermediate frequencies; marine coastal; aircraft; aircraft ground stations; various point-to-point services; broadcasting; amateur; television; and facsimile.

The two buildings are of brick and concrete construction, and were finished and finally accepted by the Government in March of this year. Efforts are being made to have the station in full operation by November 15, 1930.

SECONDARY STANDARDS OF FREQUENCY

To supplement the frequency-measuring work to be done by the station at Grand Island, Nebr., nine secondary standards of frequency stations are being installed at the following places: Boston, Mass.; Baltimore, Md.; Atlanta, Ga.; New Orleans, La.; Los Angeles and San Francisco, Calif.; Portland, Oreg.; Chicago, Ill.; and Detroit, Mich. While these secondary standards of frequency will have neither the range nor the accuracy of the station at Grand Island, with them it will be possible to monitor or measure the frequency of many of the stations in those particular areas.

The apparatus at the office of the supervisors of radio at Boston, Chicago, and Baltimore are installed and in operation. The installations at Detroit, Atlanta, and New Orleans will be completed within the next 60 days, and by November 1 all of the secondary standard installations at the places enumerated above will be installed and in operation.

RADIO FOR AVIATION

During the past year considerable thought has been given to types of radio apparatus suitable for use on airplanes and the qualifications which should be possessed by radio operators on planes.

Several of the air transport companies have established and operate their own two-way communication service between ground and plane along their respective routes. Licenses have been issued to 66 aeronautical stations and construction permits have been issued for 23 more which will make 89 aeronautical stations in operation within a short time. Last year there were 97 planes equipped with apparatus not including planes of the Army and Navy. Now there are 215 planes so equipped.

In order that life may be properly safeguarded the radio apparatus on passenger-carrying planes should receive the same attention as is now given to the radio equipment on merchant vessels.

RADIOBEACONS AND RADIO COMPASSES

Installation of radiobeacons and radio compasses continues to increase. There are in operation now 26 radiobeacons on the Atlantic coast, 18 on the Pacific coast, 7 on the Gulf coast, and 29 on the coast of the Great Lakes, a total increase for the year of 15. In other countries there are a total of 80 beacons, as compared with 57 the previous year.

Radiocompasses are now in use on 832 commercial vessels under the United States flag, an increase of 114 during the year, and on United States Government vessels there are now 436 as compared with 375 last year, making a total of 1,268 on vessels of the United States. There are 2,285 foreign vessels so equipped as compared with 1,942 last year.

AUTOMATIC ALARM SIGNAL DEVICE

During the year 755 inspections were made of vessels equipped with automatic alarms which are being used on foreign vessels, mostly British. Reports were made to the division that the device had responded 1,210 times to signals not intended to actuate the apparatus.

Last year the Coast Guard purchased two sets of this apparatus. Arrangements are being made to install one of these sets on a vessel on the Great Lakes where it can best be subjected to practical tests to determine its efficiency.

The Radiomarine Corporation is developing an alarm device which it is hoped will be ready for practical tests on the Great Lakes before this year's navigation season closes.

RADIO COMMUNICATION

During the year there has developed an increased demand for additional radiotelephone facilities both for international communication between this country and Europe and for communication with ships. The latter is a new service which, according to present indications, will grow to a considerable extent. Large ocean liners are now being equipped with radiotelephone apparatus as an additional convenience for the ocean traveler. Such equipment provides a means for conversation from ship to ship or ship to home or office on land.

POLICE RADIO

There is an increasing realization of the value of radio as used in connection with police work, both State and municipal. New York

City obtained a limited commercial station license in 1920 which authorized emergency communication with the police-patrol boat. Since early in 1922 the Pennsylvania State Police Department has made use of radio for quick point-to-point contact and later broadcasting police information. The Detroit Police Department used a broadcasting station as early as 1922. Since 1925 Dallas, Tex., has used a broadcasting station for contact with both the police and fire departments. In 1929 there were 12 police-broadcasting stations. There are now 20 such stations licensed; construction permits have been issued for 25 more, and 3 applications for construction permits are pending.

AMATEURS

After 18 months' operation under the restricted wave bands imposed by the Washington treaty of 1927, the amateurs are operating as satisfactorily as could be hoped for, considering the great number of amateur stations in these narrow bands. This is due, for the most part, to improved technical methods and apparatus devised particularly to meet the new conditions. Amateurs show increasing technical skill. Amateur voice transmission on high frequencies was given impetus by the opening of the band from 14,100 to 14,300 kilocycles for telephony as well as telegraphy. Numerous stations have effected satisfactory international telephony. Many of the better radiotelegraph stations have been in communication with upwards of 70 countries. There is an increasing interest in the investigation of the communication possibilities of the ultrahigh frequencies above 28,000 kilocycles.

Amateurs of the United States have long been noted for their excellent self-policing. In this connection it is interesting to note the establishment of an organized nation-wide, standard-frequency system to make available to amateurs, both in this country and abroad, calibration signals of known frequency, to aid amateur stations in keeping within their allotted bands. Three stations, transmitting on regular schedules, have been set up in laboratories at South Dartmouth, Mass., Elgin, Ill., and Los Angeles, Calif. The Elgin and Los Angeles installations are equipped with secondary-frequency standards checked by the Bureau of Standards; the South Dartmouth installation possesses a primary standard. The American Radio Relay League states that all transmissions are accurate to more than 0.01 per cent; measurements of the South Dartmouth transmissions indicate an accuracy for that station of approximately 0.001 per cent. This standard-frequency system is part of a program instituted by the league for an increased appreciation of frequency precision and accuracy of control by amateur operators; its good effects are already apparent.

Amateur cooperation with expeditions continued on an increased scale; there were also additional instances of cooperation with civil authorities in local storm emergencies. The pursuit of amateur radio continues to constitute a valuable training school for skilled radio personnel for industry and the art generally. The amateurs' record of public service, their spirit of cooperation, and their demonstrated national value have continued to justify the policy of this Government toward them.

During the year there was an increase of 2,165 amateur stations. This is the largest year's increase since 1922. Last year there were 16,829 licensed amateur radio stations. There are now 18,994. In 1920 there were 5,719 amateur stations.

PERSONNEL

The division's personnel is inadequate to perform promptly and completely the duties imposed upon it. For the next fiscal year a larger appropriation is being requested to remedy this condition. In the field force there are 9 supervisors, 68 inspectors, and 57 clerks assigned to 20 offices. Estimates for next year contemplate the employment of 9 supervisors, 121 inspectors, and 75 clerks, and the establishment of 6 additional offices.

INTERNATIONAL CONFERENCES

The International Radiotelegraph Convention of Washington, 1927, established an international technical consultative committee for radio communications for the purpose of studying technical and related questions having reference to these communications. Its function is limited to giving opinions on the questions submitted by the participating administrations or private enterprises and to which it has given study. The first meeting of this committee was held at The Hague, Netherlands, in September, 1929, and was attended by representatives of the United States. Preparations are being made to submit proposals for consideration at the next conference to be held at Copenhagen, Denmark, May 26 to June 6, 1931.

The International Radiotelegraph Bureau at Berne, Switzerland, has notified all administrations to prepare propositions concerning the International Radiotelegraph Convention and the two sets of regulations (general and additional) annexed thereto, in preparation for the conference to be held in Madrid, Spain, in 1932.

INTERNATIONAL RADIO ACCOUNTING

The activities of the accounting section of the radio division in the settlement for international radio tolls during the fiscal year may be summarized as follows:

Number of accounts handled:	
On hand July 1, 1929	756
Received during year	924
Total	1,680
Settled and cleared	1,111
Accounts on hand and unsettled June 30, 1930	569
Financial operations required to complete activities summarized:	
Cash balance July 1, 1929	$44,519.81
Collections during fiscal year of 1930	83,343.26
Total	127,863.07
Disbursements during fiscal year of 1930	86,912.24
Cash balance, June 30, 1930	40,950.83

It will be noted that while there was a decrease of 176 in the number of accounts received during 1930 over 1929, there was an increase of 66 in the number of accounts settled and cleared. Certain countries agreed to combine into single documents accounts which formerly, without advantage, had been rendered separately. During earlier years, delinquent administrations frequently rendered accounts covering as many as 18 or 20 months, but now accounts are submitted with sufficient regularity to assure that the maximum number of accounts received from one country at no time exceeds 12 during the year, or one for each month's traffic. The increase in the number of accounts settled and cleared is due to improved methods which made it possible to adjust all accounts of long standing. Of the 569 unsettled accounts on hand, 330 are ready for settlement and will have been cleared from the records by August 30, 1930.

Very truly yours,

W. D. TERRELL,
Chief Radio Division.

STATISTICAL TABLES

Submitted below are statistics covering the division's work.

SCOPE OF WORK

The following table shows the inspection and licensing work performed yearly from 1914 to 1930, inclusive, and the number of persons employed in the field force:

June 30—	American vessels equipped with radio	Inspections of American and foreign vessels		Frequency measurements of American and foreign stations	Licenses issued			Total field force
		Voluntary equipment	Compulsory equipment		Commercial operators	Amateur stations	Amateur operators	
1914	555	----------	6,484	----------	339	2,137	1,172	20
1915	585	----------	6,152	----------	1,653	3,547	3,067	26
1916	604	1,111	7,236	----------	1,278	4,942	4,199	28
1917	836	1,054	7,137	----------	1,682	3,741	3,303	28
1918	1,478	1,434	5,575	----------	1,616	----------	----------	29
1919	2,312	954	5,160	----------	1,645	----------	----------	27
1920	2,808	1,170	5,419	----------	4,652	5,719	6,103	25–45
1921	2,978	514	5,591	----------	2,722	7,351	6,207	26
1922	2,773	869	6,071	----------	3,136	9,525	8,920	35
1923	2,723	1,124	6,933	----------	2,860	7,821	9,908	53
1924	2,741	1,577	7,727	----------	3,370	8,205	9,545	53
1925	1,901	1,339	8,603	----------	3,215	10,074	8,293	62
1926	1,954	1,583	9,197	----------	3,398	8,037	8,140	65
1927	2,092	1,405	9,330	----------	3,463	7,123	7,275	63
1928	2,166	1,659	9,093	----------	3,816	12,386	8,369	78
1929	2,213	2,520	10,715	22,450	3,798	12,646	9,490	95
1930	2,173	3,026	11,334	45,695	5,255	18,402	11,541	131

DETAILED WORK

The following statement shows the details of the work performed during the past fiscal year compared with 1929 and the total number of licensed and Government radio stations:

Work of service	1929	1930
Clearances of American and foreign vessels required by law to be equipped with radio	15,023	15,595
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	10,715	11.334
Inspections of radio equipment on voluntarily equipped vessels	2,520	3,026
American ship radio stations inspected for license	1,102	1,287
Land stations inspected	[1] 1,154	445
Broadcasting stations inspected	----------	1,452
Amateur stations inspected	229	251
Amateur stations licensed	12,646	18,402
Frequency measurements of American and foreign stations	22,450	45,695
Commercial operators examined	3,477	5,363
Commercial operators licensed	3,798	5,255
Amateur operators examined	3,173	3,993
Amateur operators licensed	9,490	11,541
Defects found upon inspection of ship radio stations where clearance would have been in violation of law	335	382
Licensed and Government radio stations: [2]		
American vessels equipped with radio	2,213	2,173
Experimental, relay broadcasting, visual broadcasting, and technical and training-school stations	228	391
Commercial land stations [3]	446	468
Broadcasting stations [3]	614	612
Commercial aircraft stations	97	215
Geophysical stations [3]	106	119
Amateur stations	16,829	18,994
Government land stations	369	387
Government ship stations	1.211	1,161

[1] Includes broadcasting stations for 1929.

[2] Philippine stations not included.

[3] A number of stations for which construction permits have been issued but not licensed for operation up to June 30, 1930, are not included in these figures.

OPERATORS LICENSED

The following table shows the number of radio operators licensed during the past two years:

Class and grade	1929	1930	Total
Commercial extra first class	19	16	35
Commercial first class	2,080	1,932	4,012
Commercial second class	1,471	2,542	4,013
Broadcast class	113	430	543
Phone class	115	335	450
Amateur extra first grade	72	129	201
Amateur first grade	5,058	6,272	11,330
Amateur (temporary)	4,360	5,140	9,500
Total	13,288	16,796	30,084

FIELD ACTIVITIES

Following is a statement, by districts, of the work performed during the past fiscal year compared with the previous year:

Place of inspection (city or town)	Stations inspected						Frequency measurements								
							U. S. broadcast			U. S. other than broadcast			Foreign		
	Ship, under act	Ship, voluntary equipment	Ship for license	Land	Broadcast	Amateur	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations
First district:															
Boston, Mass	1,232	172	106	2	1	3	2,798	48	84	57	27	30	6	7	8
Outside Boston office	----	13	12	16	51	30	4,109	32	51	99	34	39	82	11	12
Total, 1930	1,232	185	118	18	52	33	6,907	80	135	156	61	69	88	18	20
Total, 1929	1,313	75	57	14	(1)	44	(2)	----	----	(2)	----	----	(2)	----	----
Second district:															
New York, N. Y	3,868	347	389	14	23	2	8,307	383	458	9	7	9	1	1	1
Outside New York office	296	59	60	8	24	----	----	----	----	----	----	----	----	----	----
Total, 1930	4,164	406	449	22	47	2	8,307	383	458	9	7	9	1	1	1
Total, 1929	3,813	458	439	5	(1)	21	(2)	----	----	(2)	----	----	(2)	----	----
Third district:															
Baltimore, Md	448	25	9	1	11	3	4,536	70	89	----	----	----	143	53	87
Outside Baltimore office	----	----	----	10	30	6	----	----	----	----	----	----	----	----	----
Philadelphia, Pa	531	10	5	5	88	8	----	----	----	----	----	----	----	----	----
Outside Philadelphia office	7	1	3	6	27	12	----	----	----	----	----	----	----	----	----
Norfolk, Va	748	12	9	1	4	3	----	----	----	----	----	----	----	----	----
Outside Norfolk office	----	----	----	----	2	----	----	----	----	----	----	----	----	----	----
Total, 1930	1,734	48	26	23	162	32	4,536	70	89	----	----	----	143	53	87
Total, 1929	1,539	80	49	21	(1)	20	(2)	----	----	(2)	----	----	(2)	----	----
Fourth district:															
Atlanta, Ga	----	----	----	----	5	----	1,086	45	71	1	1	1	11	7	12
Outside Atlanta office	2	----	----	6	47	6	42	3	4	----	----	----	----	----	----
Total, 1930	2	----	----	6	52	6	1,128	48	75	1	1	1	11	7	12
Total, 1929	46	4	----	41	(1)	----	(2)	----	----	(2)	----	----	(2)	----	----

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[1] Included in land for 1929.

[2] Only total figures by districts for stations of all classes compiled for 1929, which shows 22,450 measurements and 2,451 deviations.

Place of inspection (city or town)	Stations inspected						Frequency measurements								
							U. S. broadcast			U. S. other than broadcast			Foreign		
	Ship, under act	Ship, voluntary equipment	Ship for license	Land	Broadcast	Amateur	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations
Fifth district:															
New Orleans, La	607	95	85	5	18		2,899	93	112				9	5	5
Outside New Orleans office	14	51	41	27	97	14	122								
Dallas, Tex				3	9		2,328	119	194				1	1	1
Outside Dallas office				3	66	11									
Total, 1930	621	146	126	38	190	25	5,349	212	306				10	6	6
Total, 1929	599	183	142	175	(¹)	29	(²)			(²)			(²)		
Sixth district:															
San Francisco, Calif	1,439	638	271	18	49	1	5,588	56	75	117	21	41	43	14	15
Outside San Francisco office	3	21	14	91	97	12									
Los Angeles, Calif					8	7	846	39	50						
Outside Los Angeles office	379	40	15	8	33	10									
Total, 1930	1,821	699	300	117	187	30	6,434	95	125	117	21	41	43	14	15
Total, 1929	1,530	437	159	125	(¹)	2	(²)			(²)			(²)		
Seventh district:															
Seattle, Wash	668	771	175	15	71	7	4,927	86	145	10	7	7	159	106	114
Outside Seattle office	9	35	10	13	70	7									
Portland, Oreg.[3]	62	137	12	3	20	5	1,437	75	124				9	7	8
Total, 1930	739	943	197	31	161	19	6,364	161	269	10	7	7	168	113	122
Total, 1929	579	240	59	144	(¹)	8	(²)			(²)			(²)		
Eighth district:															
Detroit, Mich	413	215	8	14	10	1	1,208	39	50				2	2	2
Outside Detroit office				24	48	12									
Buffalo, N. Y	120	98	12	17	21										
Outside Buffalo office					27										
Total, 1930	533	313	20	55	106	13	1,208	39	50				2	2	2
Total, 1929	616	566	44	156	(¹)	26	(²)			(²)			(²)		
Ninth district:															
Chicago, Ill	459	133	18	17	27	1	4,132	70	111	9	3	3	1		
Outside Chicago office				18	166	16	16	3	3						
St. Paul, Minn				1											
Outside St. Paul office				42	80	33									
Duluth, Minn	29	99	15	13											
Outside Duluth office		54	18	6	4	1									
Kansas City, Mo				12	49	3	180	1	2						
Outside Kansas City office				7	97	6									
Denver, Colo				16	37	14	362						3		
Outside Denver office				3	36	17									
Total, 1930	488	286	51	135	496	91	4,690	74	116	9	3	3	4		
Total, 1929	680	477	153	473	(¹)	79	(²)			(²)			(²)		
SUMMARY															
First district	1,232	185	118	18	52	33	6,907	80	135	156	61	69	88	18	20
Second district	4,164	406	449	22	47	2	8,307	383	458	9	7	9	1	1	1
Third district	1,734	48	26	23	162	32	4,536	70	89				143	53	87
Fourth district	2			6	52	6	1,128	48	75	1	1	1	11	7	12
Fifth district	621	146	126	38	189	25	5,349	212	306				10	6	6
Sixth district	1,821	699	300	117	187	30	6,434	95	125	117	21	41	43	14	15
Seventh district	739	943	197	31	161	19	6,364	161	269	10	7	7	168	113	122
Eighth district	533	313	20	55	106	13	1,208	39	50				2	2	2
Ninth district	488	286	51	135	496	91	4,690	74	116	9	3	3	4		
Grand total, 1930	11,334	3,026	1,287	445	1,452	251	44,923	1,162	1,623	302	100	130	470	214	265
Grand total, 1929	10,715	2,520	1,102	1,154	(¹)	29									

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[1] Included in land for 1929.

[2] Only total figures by districts for stations of all classes compiled for 1929, which shows 22,450 measurements and 2,451 deviations.

[3] Opened in March, 1930.

Place of examination (city or town)	Amateur stations licensed	Operators examined							Operators licensed							
		Commercial					Amateur		Commercial					Amateur		
		Extra, first	First	Second	Broadcast	Phone	Extra, first	First	Extra, first	First	Second	Broadcast	Phone	Extra, first	First	Temporary
First district:																
Boston, Mass	1,740	--	123	252	22	6	7	235	--	116	219	18	14	6	731	341
Outside Boston office	-----	--	-----	-----	2	----	2	35	--	-----	-----	----	----	---	-----	----
Total, 1930	1,740	--	123	252	24	6	9	270	--	116	219	18	14	6	731	341
Total, 1929	1,465	3	159	70	11	(1)	13	316	3	145	112	11	(1)	8	604	311
Second district: New York, N. Y	1,890	1	668	394	32	6	12	557	11	551	460	17	6	6	849	104
Total, 1930	1,890	1	668	394	32	6	12	557	11	551	460	17	6	6	849	104
Total, 1929	1,397	3	418	158	16	(1)	10	374	5	533	221	14	(1)	7	607	60
Third district:																
Baltimore, Md	1,292	--	35	51	10	1	1	33	--	65	77	7	----	---	417	160
Outside Baltimore office	-----	--	1	-----	----	----	2	44	--	-----	-----	----	----	---	-----	----
Philadelphia, Pa	-----	--	37	89	13	2	12	142	--	79	89	10	2	10	120	----
Outside Philadelphia office	-----	--	-----	-----	----	----	----	18	--	-----	-----	----	----	---	-----	----
Norfolk, Va	-----	--	11	18	10	----	----	9	--	27	31	8	----	---	26	----
Outside Norfolk office	-----	--	-----	-----	----	----	----	12	--	-----	-----	----	----	---	-----	----
Washington, D. C	-----	--	7	44	19	----	2	57	--	18	33	14	----	2	63	----
Total, 1930	1,292	--	91	202	52	3	17	315	--	189	230	39	2	12	626	160
Total, 1929	1,138	1	167	79	20	(1)	13	233	4	214	117	17	(1)	6	478	93
Fourth district:																
Atlanta, Ga	835	--	25	28	38	----	6	33	--	44	101	29	4	8	174	446
Outside Atlanta office	-----	--	31	84	30	4	11	158	--	-----	-----	----	----	---	-----	----
Total, 1930	835	--	56	112	68	4	17	191	--	44	101	29	4	8	174	446
Total, 1929	659	--	35	38	28	(1)	10	84	--	43	35	17	(1)	9	112	320
Fifth district:																
New Orleans, La	1,044	--	68	198	14	1	1	45	--	250	358	41	7	4	231	546
Outside New Orleans office	-----	--	26	108	57	2	3	134	--	-----	-----	----	----	---	-----	----
Dallas, Tex	-----	--	-----	35	24	2	2	33	--	11	39	31	3	4	83	----
Outside Dallas office	-----	--	5	28	34	1	4	70	--	-----	-----	----	----	---	-----	----
Total, 1930	1,044	--	99	369	129	6	10	282	--	261	397	72	10	8	314	546
Total, 1929	832	--	245	198	42	(1)	7	152	1	281	208	23	(1)	5	179	475
Sixth district:																
San Francisco, Calif	3,392	1	352	129	17	104	9	181	5	325	222	18	148	15	860	424
Outside San Francisco office	-----	--	2	2	5	48	6	63	--	-----	-----	----	----	---	-----	----
Los Angeles, Calif	-----	--	130	123	24	81	11	233	--	112	141	16	71	10	318	1
Outside Los Angeles office	-----	--	12	14	----	----	2	46	--	-----	-----	----	----	---	-----	----
Total, 1930	3,392	1	496	268	46	233	28	523	5	437	363	34	219	25	1,178	425
Total, 1929	881	2	295	153	35	(1)	35	427	5	416	240	32	(1)	19	1,047	370
Seventh district:																
Seattle, Wash	1,097	--	157	133	34	15	1	97	--	161	178	40	10	2	351	255
Outside Seattle office	-----	--	26	73	18	2	5	131	--	-----	-----	----	----	---	-----	----
Portland, Oreg.[2]	-----	--	-----	8	1	----	1	4	--	-----	5	1	----	1	4	----
Total, 1930	1,097	--	183	214	53	17	7	232	--	161	183	41	10	3	355	255
Total, 1929	940	--	168	167	19	(1)	5	232	--	167	150	24	(1)	2	331	230
Eighth district:																
Detroit, Mich	2,876	--	15	141	46	20	3	102	--	51	181	34	22	6	606	1,351
Outside Detroit office	-----	--	3	18	15	----	9	180	--	-----	-----	----	----	---	-----	----
Buffalo, N. Y	165	--	11	43	35	----	4	21	--	24	43	24	----	11	170	42
Outside Buffalo office	-----	--	-----	16	6	----	9	171	--	-----	-----	----	----	---	-----	----
Total, 1930	3,041	--	29	218	102	20	25	474	--	75	224	58	22	17	776	1,393
Total, 1929	1,976	--	118	127	55	(1)	23	420	1	110	147	38	(1)	9	554	1,058
Ninth district:																
Chicago, Ill	4,071	--	34	298	88	28	9	250	--	64	280	62	33	29	931	1,470
Outside Chicago office	-----	--	2	24	30	1	33	367	--	-----	-----	----	----	---	-----	----
St. Paul, Minn	-----	--	3	30	28	1	----	38	--	8	19	12	1	---	48	----
Outside St. Paul office	-----	--	-----	-----	----	----	----	13	--	-----	-----	----	----	---	-----	----

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[1] Included in broadcast for 1929.

[2] Opened in March, 1930.

Place of examination (city or town)	Amateur stations licensed	Operators examined							Operators licensed							
		Commercial					Amateur		Commercial					Amateur		
		Extra, first	First	Second	Broadcast	Phone	Extra, first	First	Extra, first	First	Second	Broadcast	Phone	Extra, first	First	Temporary
Ninth district—Continued.																
Duluth, Minn	------	--	5	16	7	----	----	9	--	5	7	1	----	---	19	-----
Outside Duluth office	------	--	----	----	----	----	----	16	--	----	----	----	----	---	----	-----
Kansas City, Mo	------	--	4	40	41	1	1	42	--	17	48	26	9	13	222	-----
Outside Kansas City office	------	--	9	28	17	----	14	202	--	----	----	----	----	---	----	-----
Denver, Colo	------	--	5	14	31	1	3	22	--	4	11	21	5	2	49	-----
Outside Denver office	------	--	----	----	----	----	----	5	--	----	----	----	----	---	----	-----
Total, 1930	4,071	--	62	450	242	32	60	964	--	98	365	122	48	44	1,269	1,470
Total, 1929	3,358	1	252	314	80	(1)	24	795	--	171	241	52	(1)	7	1,146	1,443
SUMMARY																
First district	1,740	--	123	252	24	6	9	270	--	116	219	18	14	6	731	341
Second district	1,890	1	668	394	32	6	12	557	11	551	460	17	6	6	849	104
Third district	1,292	--	91	202	52	3	17	315	--	189	230	39	2	12	626	160
Fourth district	835	--	56	112	68	4	17	191	--	44	101	29	4	8	174	446
Fifth district	1,044	--	99	369	129	6	10	282	--	261	397	72	10	8	314	546
Sixth district	3,392	1	496	268	46	233	28	523	5	437	363	34	219	25	1,178	425
Seventh district	1,097	--	183	214	53	17	7	232	--	161	183	41	10	3	355	255
Eighth district	3,041	--	29	218	102	20	25	474	--	75	224	58	22	17	776	1,393
Ninth district	4,071	--	62	450	242	32	60	964	--	98	365	122	48	44	1,269	1,470
Grand total, 1930	18,402	2	1,807	2,479	748	327	185	3,808	16	1,932	2,542	430	335	129	6,272	5,140
Grand total, 1929	12,646	10	1,857	1,304	306	(1)	140	3,033	19	2,080	1,471	228	(1)	72	5,058	4,360

(1) Included in broadcast for 1929.

COST OF RADIO SERVICE

The following statement shows the detailed expenditures of the radio service for 1930 and the appropriation and proposed allotment for the fiscal year 1931.

	1930	1931
Salaries:		
District of Columbia	$57,875	$59,112
Field	269,789	314,240
Total	327,664	373,352
General expenses:		
Travel and subsistence	28,557	19,500
Furniture and fixtures, office	4,419	3,500
Test cars and equipment	19,772	9,800
Motor vehicles	676	------------
Technical instruments and supplies	16,787	34,192
General expenses—Con.		
Rents	$21,990	$23,591
Office supplies and stationery	2,699	3,500
Communications	4,202	3,850
Miscellaneous expenses	6,082	2,545
Total	432,848	473,830
Transferred to F. R. C	25,000	------------
Unobligated balance	2,152	------------
Reserve	------------	28,542
Total appropriations	[1] 460,000	[2] 502,372

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[1] In addition to the regular amount appropriated for 1930, $460,000, by act of Congress $50,000 was made available for the purchase of a site and for the construction of a constant-frequency monitoring radio station at Grand Island, Nebr. $48,400.43 of the $50,000 has been expended.

[2] $2,372 is Brookhart Act effective July 3, 1930.

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U. S. DEPARTMENT OF COMMERCE
R. P. LAMONT, Secretary
RADIO DIVISION
W D. TERRELL, Director

Selection from

ANNUAL REPORT

OF THE

DIRECTOR OF RADIO DIVISION

TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1931

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON : 1931

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RADIO DIVISION

Department of Commerce,
Radio Division,
Washington, July 1, 1931.

The Secretary of Commerce.

Dear Mr. Secretary: In response to your request I furnish the following condensed report of the work of the Radio Division during the past fiscal year, including references to related developments which have taken place during that period.

LEGISLATION

The Seventy-first Congress, third session, did not enact any radio legislation respecting the duties of the Radio Division. The only piece of special legislation concerning this division was the act authorizing the increased expense for Grand Island, Nebr., where the constant frequency monitoring station is situated. Another bill, S. 5503, was introduced to enlarge this activity by purchasing additional land, erecting additional antennas, and putting up an administration building. This bill did not pass the House of Representatives.

RADIO INSPECTION SERVICE

Inspections of the radio installations on ships are made to determine that the apparatus is in good working order and in charge of competent operators. It has for its purpose, of course, the protection of life and property.

As the law now reads, it applies to steamers only. It has been found in connection with this inspection work that there are a number of vessels propelled by Diesel engines which do not properly come under the classification of steamers, and as these vessels frequently carry 50 or more persons, the law should be amended to include this type of vessel. Such amendment could be accomplished by the substitution of the word "vessel" for the word "steamer" where it appears in the first and second sections of the act of June 24, 1910, as amended July 23, 1912.

Other inspections of the radio installations on ships and the inspection of radio stations on land are performed under authority of the radio act of 1927. Such inspections are in the nature of a general survey of the stations for the purpose of determining if the station inspected complies in every respect with the information furnished by the owner of the station in his application for a radio station license. The inspection includes verification as to the power used by the station, the wave lengths, or frequencies, to which the station may be adjusted, type of apparatus, location of station, and numerous other details.

The radio stations to be inspected are situated in all parts of the United States, Alaska, Hawaii, and Porto Rico. It is not possible with the limited inspection force of the Radio Division to inspect regularly the more than 26,000 licensed radio transmitting stations.

Those in Alaska have never been inspected, those in Hawaii and Porto Rico only on rare occasions, and a large number in the United States, principally those used by amateurs, have not been inspected. With a larger force of inspectors, a considerable number of unlicensed stations would be discovered and required to obtain a license or cease operation.

An increase is shown in all inspection duties during the past fiscal year. In the fiscal year 1930 there were 15,595 clearances of foreign and American vessels required by law to be fitted with radio apparatus and 11,334 inspections. For the fiscal year 1931 there were 15,408 clearances and 11,433 inspections. During the year 1930 there were 17,795 inspections made of all classes of stations, including ships. The number of such inspections increased to 19,458 for 1931.

Inspections during the year 1931 developed 315 defects in the radio installations on ships, which were remedied before the vessels departed. During the previous year there were 382 such defects reported. It is believed that the reduced number of defects reported for the latter period is due to the improvement in radio apparatus installed and the careful attention which has been given to radio apparatus when these inspections were made, which encourages radio operators and others concerned in keeping their apparatus in good working order.

Much of the work performed by the inspection force requires travel, either by train or by radio test cars, because of radio stations being located in practically every city of importance in the United States and many of them in rural sections. During the year 1930, 1,577 inspection trips were made and 534 cities visited, while in 1931, 1,135 inspection trips were made and 501 cities visited.

One trip was made to Porto Rico by the division's representative at Atlanta, Porto Rico being a part of the fourth radio district. This was the second inspection trip made to Porto Rico since the radio law has been in effect. The previous trip was made in 1913.

During the coming summer it is planned to have the supervisor of radio at San Francisco make a trip to Hawaii, which has not been visited for several years. Because of numerous difficulties, such as transportation, shortage of personnel, and lack of funds, it has not been possible to make an inspection trip to Alaska.

Under the radio act of 1927 all the licensed radio stations must be operated by licensed radio operators. The applicants for such licenses are given a comprehensive examination to determine their fitness. The qualifications required depend on the class of station to be operated and the class of licensed operator such station must employ. Operators for employment on ships and those on land making use of the International Telegraph Code must pass a code examination as well as a written examination, designed to develop the applicant's knowledge of the apparatus he intends to use, how to repair such apparatus or keep it in proper working order, knowledge of the national and international laws in so far as they apply to his duties, and knowledge of operating procedure intended to prevent interference and to insure orderly operation of stations.

There are 10 classes of licenses. During the early years of radio there were only 3 classes of licenses—commercial first class, commercial second class, and amateur. Additional classes have become necessary because of the development of new radio services such as broadcasting, police radio, aviation, and radiotelephone.

During the year examinations were given to 11,850 applicants for radio operators' licenses. Of this number 5,776 were for commercial licenses and 6,073 for amateur licenses. Last year there were 5,363 applicants for commercial licenses and 3,993 for amateur licenses, making a total of 9,356.

Licenses were issued to 20,703 radio operators during the year, of which there were 5,506 commercial and 15,197 amateur. The previous year's figures are 5,255 commercial and 11,541 amateur. The foregoing figures include renewal licenses issued without reexamination.

FIELD SURVEY

During the year the traveling supervisor of radio made an inspection trip which covered five radio inspection districts, the fourth, fifth, sixth, seventh, and ninth.

The primary purpose of this trip was to coordinate the work of the several offices and to obtain direct information as to the problems encountered and the possible need for additional personnel and equipment.

The supervisor found to exist a pressing need for additional personnel and equipment by practically all of the offices he visited. This need, however, will be substantially reduced soon by reason of increased appropriations for the fiscal year 1932. His report contains a gratifying statement with reference to the good will existing between the public and the Radio Division and appreciation of its cooperative efforts and desire to be helpful in connection with the enforcement of the radio law.

RADIO TEST CARS

During the past fiscal year, two additional test cars were placed in service, one at Boston and the other at Seattle. This brings the total number of cars in service to eight. The cars delivered to Boston and Seattle are not yet equipped with field strength measuring apparatus, or mobile secondary standards of frequency, but it is contemplated that this equipment will be installed in the early fall of 1931.

With the six radio test cars, fully equipped with field strength measuring apparatus and mobile secondary standards of frequency, it has been possible during the past year, to make a large number of field strength surveys to determine the service areas of broadcast stations, and ascertain whether or not they render good broadcast service to radio listeners in their respective areas. With these cars, it has also been possible to ascertain the energy in harmonics from broadcast and other stations, with a view to the elimination of these parasitic radiations.

During the fiscal year 1932, two or more of the chassis on the radio test cars now in use should be replaced, as these cars now have been run in excess of 60,000 miles. The repair items on these cars will gradually increase with their mileage, and since they are required to travel all kinds of roads in all kinds of weather and transport the delicate precision apparatus, the cars must be kept in a high state of repair at all times.

It would not be possible, to-day, to do our field work and the monitoring of low-power radio stations without these cars. Additional cars could be used to advantage if placed in service at New York, Los Angeles, and Kansas City.

MOBILE STANDARDS ON RADIO TEST CARS

The large number of low-power broadcast and other stations which operate on shared channels in the United States cause very serious heterodyne interference, and in many cases it is impossible to measure the frequency of these stations at the regular monitoring stations. To take care of this situation, mobile standards have been placed on six of the radio test cars located at Baltimore, Atlanta, Dallas, San Francisco, Chicago, and Detroit. With this equipment, it is possible, in many cases, to reduce heterodyne interference on broadcast channels adjacent to shared channels by making sure that the low power stations are operating on their assigned frequencies.

MONITORING BROADCASTING STATIONS

Although the monitoring stations at Boston, Baltimore, Atlanta, New Orleans, Los Angeles, San Francisco, Portland, Oreg., Detroit, Chicago, and Grand Island maintain watches less than 8 hours out of the 24 during working days, these stations reported 76,447 frequency measurements during the fiscal year as compared with 45,695 for the previous year. The United States stations measured are classified as follows:

Broadcasting	469	Police	18
Commercial	142	Aeronautical land	17
Amateur	336	Ship	10
Experimental	60	Airplanes	4
Government	59		
Unidentified	23	Total	1, 138

Stations were measured in 36 foreign countries. These stations are classified as follows:

Broadcasting	31	Ships	5
Commercial	125		
Amateur	27	Total	188

The records of the division show a constantly increasing improvement in frequency control since the monitoring work of the division was undertaken. As an illustration, in December 339 broadcasting stations were measured. The frequency variation of 35 of these stations was less than 100 cycles above or below the assigned frequency. The frequency variation of 66 of these stations was less than 200 cycles above or below the assigned frequency, while the frequency variation of 238 of these stations was more than 200 cycles above or below their assigned frequencies.

In June 330 stations were measured. The frequency variation of 97 of these stations was less than 50 cycles above or below their assigned frequencies. The frequency variation of 71 of these stations was less than 100 cycles above or below their assigned frequencies. The frequency variation of 69 of these stations was less than 200 cycles above or below their assigned frequencies. The frequency variation of 93 of these stations exceeded 200 cycles.

At the present time the Federal Radio Commission requires broadcasting stations operating between 550 and 1,500 kilocycles to maintain their assigned frequencies between the limits of 500 cycles per second above to 500 cycles per second below the assigned frequency.

Beginning with June 22, 1932, the tolerance of 500 cycles now permitted will be reduced to 50 cycles. The reduced tolerance will necessitate broadcasting stations exercising greater care and in some cases providing better equipment. It is anticipated that this will also mean a considerable increase in the work of the monitoring stations.

CONSTANT FREQUENCY STATION

The construction work on the large frequency monitoring station at Grand Island, Nebr., was practically finished during the fiscal year. The Diesel-engine driven generators were installed in the power house and placed in operation on December 5, 1930, and frequency measurement work was begun about the middle of February, with a small, inadequate corps of radio engineers and other personnel. During the brief time the station has been in operation, highly accurate frequency measurements are being made daily on radio stations in the United States and foreign countries. Telephone and telegraph stations in Argentine, Austria, Australia, Brazil, Belgium, Canada, Chile, Cuba, Colombia, Costa Rica, China, Czechoslovakia, Dominican Republic, England, Egypt, France, Germany, Hawaii, Holland, Indo-China, Italy, Japan, Java, Madagascar, Morocco, Mexico, Norway, New Caledonia, New Zealand, Portugal, Philippine Islands, Panama, Persia, Russia, Spain, Syria, Venezuela, and other countries are received and measured daily. At the present time, due to insufficient personnel, the station is in operation only 16 hours daily; thus, full advantage can not be taken of all the facilities at the station for making frequency measurements and other observations.

Since the station was placed in operation in February, a total of 3,029 measurements have been made. At the end of the fiscal year, 167 different radio stations located in foreign countries had been measured, a total of 789 measurements being made on these stations. It is interesting to note that a very large number of these stations failed to maintain their assigned operating frequencies, and in many cases were observed to be causing interference with radio telephone and telegraph stations operating in the United States. In addition to the foreign stations measured, 2,240 measurements were made at Grand Island on 650 individual radio telephone and telegraph stations within the continental limits of the United States.

It requires 9 skilled radio engineers to intercept and measure the signals from radio telephone and telegraph stations, each watch, at Grand Island. These watches, at the present time, are of 8 hours duration, and sufficient personnel should be provided so as to make available the required number of engineers for each watch, and to have the station in operation 24 hours each day. If this were done, it would be possible to make 2,000 or more accurate measurements per month, in addition to making other observations, such as channel congestion, material broadcast, improper use of frequency assignment, and other special tests.

The antenna systems at Grand Island are inadequate to cover the United States. Two additional broadcast antennas should be provided, one for reception of stations in southeastern United States and the other for stations in northwestern United States. In addition to these antennas for broadcast purposes only, additional antennas for high-frequency reception are needed. Two additional receivers, one for high-frequency work, the other for broadcast and other services, could be used to advantage. A high-speed recorder should be provided for the interception and identification of high speed automatic transmitting stations, and their frequencies measured. An experimental receiver for interception of television and measurement of the frequencies of television stations should be obtained as soon as possible. At the present time these stations can be measured but can not be identified.

The public has shown great interest in the station, this interest being evidenced by the fact that 2,219 persons have visited this station since March 15, 1931. They have registered from almost every State in the Union, and include Representatives from both Houses of Congress, and officials from the larger radio and telephone operating companies.

SECONDARY STANDARD MONITORING STATIONS

During the past fiscal year, nine secondary standard stations were installed and placed in operation in the following cities: Atlanta, Baltimore, Boston, Chicago, Detroit, New Orleans, Los Angeles, San Francisco, and Portland. With these secondary standards of frequency, it has been possible to measure the frequencies of many hundreds of transmitting stations in the United States and some foreign stations.

The increasing accuracy of frequency maintained by radio stations is conclusive evidence of the benefits derived by station owners and listeners since monitoring by these stations began.

MEASUREMENT OF THE QUALITY AND QUANTITY OF MODULATION

For some time tests have been carried on to determine a satisfactory method of measuring the percentage of modulation at broadcasting and other radiotelephone stations. The Radio Division now has portable and highly accurate equipment in use for the measurement of the power or field strength of radio stations and for the measurement of the frequencies of stations. To make its service complete it is necessary to measure the third characteristic of a radiotelephone station, which is its degree and quality of modulation. This characteristic is the one which definitely determines the quality of reception. The necessity for modulation measurements are, therefore, apparent.

Many experiments have been conducted by the Radio Division during the past several months on all available types of modulated radio transmitters to determine how these measurements could best be made. These experiments have gone so far as to include television.

A special instrument developed for the purpose has been used with very satisfactory results. By means of it many radio broadcasting stations have been able to make adjustments to their transmitters which very materially improved their service to the public. These adjustments could not have been made without some device of this nature and the cooperation which has been rendered in this field is a source of considerable satisfaction.

Further tests are being conducted with a view to being able not only to measure the percentage of modulation and the quality of it but also the determination of the degree of distortion which might be present. Similar tests are also being conducted to measure these important factors at the various monitoring stations operated by this division so that it will not always be necessary to take the equipment to the station under observation to make the test.

These tests, and the development of equipment under them, have been especially significant in that they enable the broadcaster to improve his service to the public and the radio listening public to enjoy better radio reception through the reduction in distortion. Also, they show directly whether the station is meeting the requirements of the Federal Radio Commission with respect to quantity and quality of modulation.

RADIO FOR AVIATION

There has been an encouraging increase in the use of radio in the aeronautical service during the past year. The records of the division show that licenses have been issued to 99 aeronautical stations and 17 permits have been issued for construction of aeronautical stations. When these stations are constructed there will be a total of 116 such stations as compared with 66 stations and 23 outstanding construction permits last year. Last year there were 215 planes equipped with radio. There are now 303. The above figures do not include Government stations.

The ground stations are spaced along the airways so as to insure continuous communication between aircraft in flight and the station on the ground. There is an average separation between ground stations of 200 miles so that the maximum range to be covered in communication is approximately 100 miles. Experience has shown that with this fairly close spacing of transmitters reliable communication can be conducted under any but the most adverse conditions.

Radiotelephone apparatus is most generally used. The aircraft radiophone installations are extremely simple and are controlled by a single push button so that the pilot may operate the system with a minimum of effort. Trailing antennas such as necessary when longer wave lengths are used have been eliminated, making it possible for aircraft to engage in transmission while on the ground as well as in the air. The traffic handled consists of messages relating to safety, position reports, meteorological reports, arrivals and departures, and anything pertinent to the movement of aircraft.

RADIOBEACONS AND RADIOCOMPASSES

Safety of navigation has been further increased through the installation of additional radiobeacons and radiocompasses. There are 90 radiobeacons in use in the United States at the present time, an increase of 10 over the preceding year.

The radiocompass is recognized as one of the most useful aids to navigation in use on vessels. Its value in locating vessels in distress has been demonstrated frequently. On vessels of the United States there are 1,334 radiocompasses installed, an increase of 66 during the last fiscal year.

Reports from many of the air-mail operators indicate improvement in their performance schedules through the use of these radio aids to navigation.

An observer of foreign aeronautical radio services expresses the conviction that our system of Government and private aids to air navigation are unequaled in the balance of the world.

AUTOMATIC ALARM SIGNAL DEVICE

Inspection of automatic alarm devices was continued during the past fiscal year. In this period 871 inspections were made of these instruments, used exclusively on foreign vessels. According to reports made to the division by its inspectors these devices responded 1,244 times to signals not intended to actuate the apparatus. Last year there were 755 inspections and 1,210 false alarms, usually reported as caused by heavy static or the operation of near-by transmitters. The consensus of opinion seems to be that the alarms now used are possibly of greater value than the untrained watcher, but provides a poor substitute for a trained licensed radio operator. The division is preparing to observe tests of two such devices manufactured in this country which are to be installed on vessels on the Great Lakes during the coming summer.

POLICE RADIO

The use of radio as an aid in directing the work of police continues to grow. Last year there were 20 radio transmitting stations used by police departments, while this year there are 53 such stations licensed and in operation and construction permits have been issued for 10 more.

According to a report made by the chief of police in an important western city, during one month of the fiscal year just closed 80 stolen automobiles were recovered and arrests were made in connection therewith, 9 persons were arrested charged with robbery, etc., 11 persons were arrested for violations of the traffic laws, and 1 person was arrested charged with intent to commit murder. This police chief states: "This is a remarkable showing when one realizes that the results were obtained solely through the radio broadcasting available to this department up to 11 p. m. daily, after which hour we have no such service." The city referred to above now has a radio broadcasting station of its own which can be used 24 hours each day.

AMATEURS

The past fiscal year shows increasing interest on the part of amateurs. In 1929 there were 16,829 licensed amateur radio stations, in 1930 there were 18,994, and this year there are 22,739. These figures indicate that the amateurs are by far the largest users of transmitting radio stations in the United States. In addition to the licenses issued to the amateur stations, correspondence with the Radio Division shows that there are more young men making inquiry with reference to obtaining such licenses than in any previous year. It is believed that this growing interest may be attributed to the use of the radiotelephone by amateurs.

The amateurs have given much attention to attaining frequency precision and control of their apparatus. The standard frequency system sponsored by the American Radio Relay League, and inaugurated last year on a nation-wide basis, has been continued during the fiscal year just ended. As high as 300 calibrations a month have been reported from this service. The benefits derived from these standard transmissions sent by the amateurs themselves are not confined to the amateurs in this country. It is reported that many foreign amateurs, particularly those in South Africa and Australia, have been utilizing these transmissions on the higher frequencies.

With such a service regularly available, considerable interest has been evinced in the popularization of measuring equipment of a standard comparable in accuracy and stability to the transmissions, and yet within the financial and constructional abilities of the average amateur. The American Radio Relay League reports that their laboratory work has resulted in the development of dynatron oscillator equipment which fulfills these specifications, affording tolerances well within 0.01 per cent and still easily constructed and calibrated. With such equipment available, together with the transmissions supplied by the standard frequency stations, large numbers of amateurs have built and now possess measuring apparatus equal to that in many laboratories. The good effects have been apparent. In line with their long established self-policing policy, the amateurs have created a system of official observing stations, the amateur stations so appointed being equipped with reasonably accurate measuring apparatus for regularly observing and reporting any off-frequency violators among the amateur ranks. The American Radio Relay League reports that approximately 100 appointments have been made.

The communications possibilities of frequencies on the order of 56,000 kilocycles have been examined and considerable development work accomplished in the design of radiotelephone transmitters and special receivers of the superregenerative type to work on these frequencies.

While no major emergency occurred in the United States to enable the amateurs to participate in the storm relief work for which they have been noted in recent years, greater cooperation has been afforded to more than a dozen expeditions sailing from the United States, and increased activity is reported in connection with the Naval Radio Reserve and the Army Amateur Radio System.

The monitoring stations of the division are regularly engaged in measuring the frequencies of amateur stations. Comparatively few violations have been found and only a few have been penalized for such violations. It seems evident that the amateurs realize that their future success and public good will depend upon the operation of their stations in an orderly manner, having due regard for other users including the broadcast listeners. When a new amateur enters the field his transmissions are usually observed by the older amateurs who take such action as may be necessary to bring him in line with the self-policing policy of the organization.

INTERNATIONAL CONFERENCES

The first meeting of the International Technical Consultative Committee on Radio Communications for the purpose of studying technical and related questions was held at The Hague, Netherlands, in

September, 1929. The second meeting of this committee was held at Copenhagen, Denmark, May 27 to June 8, 1931. Representatives of the government departments interested in the subjects to be considered and representatives of commercial companies attended this meeting. The next meeting which is to be held in 1933 will be at Lisbon, Portugal. The date of holding this meeting has not been announced.

The United States proposals for consideration at the International Radio Telegraph Conference to be held in Madrid, Spain, in September, 1932, have been submitted to the International Radio Telegraph Bureau, Berne, Switzerland, for distribution to members of the union. The exact date of holding the conference in Madrid has not been announced.

In view of the fact that this conference will be a joint conference of members of the International Telegraph Convention and the International Radio Telegraph Convention and the importance of some of the problems to be considered, it seems probable that the duration of the conference will be longer than those held heretofore.

INTERNATIONAL RADIO ACCOUNTING

Activities of the international radio accounting section during the fiscal year just ended may be summarized as follows:

Number of accounts handled:	
On hand July 1, 1930	569
Received during year	1, 099
Total	1, 668
Settled and cleared	1, 237
Accounts on hand and unsettled June 30, 1931	431
Financial operations required to complete activities summarized:	
Cash balance July 1, 1930	$40, 950. 83
Collections during fiscal year of 1931	65, 591. 46
Total	106, 542. 29
Disbursements during fiscal year of 1931	80, 572. 11
Cash balance, July 1, 1931	25, 970. 18

It is apparent from these figures that the number of accounts received from foreign administrations has increased over last year's receipts. This increase was taken care of in the number of accounts settled and cleared. The number of accounts remaining on hand at the end of last fiscal year was also reduced by 138 accounts.

In spite of the increased volume in number of accounts received and cleared, there has been a reduction in the money transaction which would indicate that the volume of radiotelegrams exchanged by American vessels and foreign coastal and ship stations was less in 1931 than in 1930.

The decrease in the cash balance of the year indicates only that the 431 accounts remaining on hand and unsettled involve a proportionately lower amount of partially collected tolls.

Very truly yours,

W. D. Terrell,
Director of Radio.

STATISTICAL TABLES

Submitted below are statistics covering the division's work.

The following table shows the inspection and licensing work performed yearly from 1922 to 1931, inclusive, and the number of persons employed in the field force:

June 30—	American vessels equipped with radio	Inspections of American and foreign vessels		Frequency measurements of American and foreign stations	Licenses issued			Total field force
		Voluntary equipment	Compulsory equipment		Commercial operators	Amateur stations	Amateur operators	
1922	2,773	869	6,071		3,136	9,525	8,920	35
1923	2,723	1,124	6,933		2,860	7,821	9,908	53
1924	2,741	1,577	7,727		3,370	8,205	9,545	53
1925	1,901	1,339	8,603		3,215	10,074	8,293	62
1926	1,954	1,583	9,197		3,398	8,037	8,140	65
1927	2,092	1,405	9,330		3,463	7,123	7,275	63
1928	2,166	1,659	9,093		3,816	12,386	8,369	78
1929	2,213	2,520	10,715	22,450	3,798	12,646	9,490	95
1930	2,173	3,026	11,334	45,695	5,255	18,402	11,541	131
1931	2,261	3,719	11,433	76,447	5,506	4,060	15,197	140

DETAILED WORK

The following statement shows the details of the work performed during the past fiscal year compared with 1930 and the total number of licensed and Government radio stations:

Work of service	1930	1931
Clearances of American and foreign vessels required by law to be equipped with radio	15,595	15,408
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	11,334	11,433
Inspections of radio equipment on voluntarily equipped vessels	3,026	3,719
American ship radio stations inspected for license	1,287	1,355
Land stations inspected	445	720
Broadcasting stations inspected	1,452	1,805
Aircraft stations inspected		73
Amateur stations inspected	251	353
Amateur stations licensed [1]	18,402	4,060
Frequency measurements of American and foreign stations	45,695	76,447
Commercial operators examined	5,363	5,776
Commercial operators licensed	5,255	5,506
Amateur operators examined	3,993	6,073
Amateur operators licensed	11,541	15,197
Defects found upon inspection of ship radio stations where clearance would have been in violation of law	382	315
Licensed and Government radio stations: [2]		
American vessels equipped with radio	2,173	2,261
Experimental, relay broadcasting, visual broadcasting	391	231
Commercial land stations [3]	468	628
Broadcasting stations [3]	612	613
Commercial aircraft stations	215	303
Geophysical stations [3]	119	113
Amateur stations	18,994	22,739
Government land stations	387	420
Government ship stations	1,161	1,046

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[1] Discontinued Sept. 30, 1930.

[2] Philippine stations not included.

[3] A number of stations for which construction permits have been issued but not licensed for operation up to June 30, 1931, are not included in these figures.

OPERATORS LICENSED

The following table shows the number of radio operators licensed during the past two years:

Class and grade	1930	1931	Class and grade	1930	1931
Commercial extra first class	16	22	Amateur extra first grade	129	220
Commercial first class	1, 932	1, 649	Amateur first grade	6, 272	8, 253
Commercial second class	2, 542	2, 837	Amateur (temporary)	5, 140	6, 724
Commercial third class	----	41			
Broadcast class	430	514	Total	16, 796	20, 703
Phone class	335	543			

FIELD ACTIVITIES

Following is a statement, by districts, of the work performed during the past fiscal year compared with the previous year:

Place of inspection (city or town)	Stations inspected							Frequency measurements								
								United States broadcast			United States other than broadcast			Foreign		
	Ship, under act	Ship, voluntary equipment	Ship for license	Land	Broadcast	Amateur	Aircraft	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations
First district:																
Boston, Mass	1, 285	161	124	5	2	7	0	6, 147	22	37	805	339	356	1	0	0
Outside	0	32	23	26	39	21	0	6, 737	54	96	1, 320	289	294	516	174	181
Total, 1931	1, 285	193	147	31	41	28	0	12, 884	76	133	2, 125	628	650	517	174	181
Total, 1930	1, 232	185	118	18	52	33	----	6, 907	80	135	156	61	69	88	18	20
Second district:																
New York, N. Y	3, 962	338	371	18	38	17	0	6, 914	63	108	20	4	9	9	2	3
Outside	272	57	61	6	15	2	0	0	0	0	0	0	0	0	0	0
Total, 1931	4, 234	395	432	24	53	19	0	6, 914	63	108	20	4	9	9	2	3
Total, 1930	4, 164	406	449	22	47	2	----	8, 307	383	458	9	7	9	1	1	1
Third district:																
Baltimore, Md	472	5	0	9	16	1	0	3, 894	146	207	1, 123	68	81	330	90	106
Outside	0	0	0	19	31	3	0	0	0	0	0	0	0	0	0	0
Philadelphia, Pa	510	8	5	3	69	9	0	0	0	0	0	0	0	0	0	0
Outside	2	2	2	19	24	4	0	0	0	0	0	0	0	0	0	0
Norfolk, Va	870	53	29	1	23	0	0	0	0	0	0	0	0	0	0	0
Outside	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0
Total, 1931	1, 854	68	36	52	166	17	0	3, 894	146	207	1, 123	68	81	330	90	106
Total, 1930	1, 734	48	26	23	162	32	----	4, 536	70	89	0	0	0	143	53	87
Fourth district:																
Atlanta, Ga	0	0	0	1	3	0	0	1, 640	28	44	242	5	6	12	1	0
Outside	4	0	1	12	71	13	0	0	0	0	0	0	0	0	0	0
Total, 1931	4	0	1	13	74	13	0	1, 640	28	44	242	5	6	12	1	0
Total, 1930	2	0	0	6	52	6	----	1, 128	48	75	1	1	1	11	7	12
Fifth district:																
New Orleans, La	581	155	115	4	29	1	0	5, 642	98	144	381	17	19	111	32	40
Outside	6	32	29	22	68	18	0	----	----	----	----	----	----	----	----	0
Dallas, Tex	0	0	1	6	10	5	0	3, 966	50	113	0	0	0	50	12	15
Outside	0	0	0	23	76	7	0	----	----	----	----	----	----	----	----	0
Total, 1931	587	187	145	55	183	31	0	9, 608	148	257	381	17	19	161	44	55
Total, 1930	621	146	126	38	190	25	----	5, 349	212	306	0	0	0	10	6	6

Place of inspection (city or town)	Stations inspected: Ship, under act	Stations inspected: Ship, voluntary equipment	Stations inspected: Ship for license	Stations inspected: Land	Stations inspected: Broadcast	Stations inspected: Amateur	Stations inspected: Aircraft	Frequency measurements: United States broadcast: Measurements	Frequency measurements: United States broadcast: Stations deviating	Frequency measurements: United States broadcast: Deviations	Frequency measurements: United States other than broadcast: Measurements	Frequency measurements: United States other than broadcast: Stations deviating	Frequency measurements: United States other than broadcast: Deviations	Frequency measurements: Foreign: Measurements	Frequency measurements: Foreign: Stations deviating	Frequency measurements: Foreign: Deviations
Sixth district:																
San Francisco, Calif	1,417	615	233	17	59	21	0	2,592	21	25	314	34	37	18	9	10
Outside	4	8	11	105	130	17	2	3,983	67	81	357	44	48	69	31	32
Los Angeles, Calif	0	0	0	3	25	12	1	0	0	0	0	0	0	0	0	0
Outside	292	37	18	24	23	7	5	1,898	35	61	306	44	73	15	2	2
Total, 1931	1,713	660	262	149	237	57	8	8,473	123	167	977	122	158	102	42	44
Total, 1930	1,821	699	300	117	187	30	----	6,434	95	125	117	21	41	43	14	15
Seventh district:																
Seattle, Wash	794	1,182	173	59	103	13	27	0	0	0	0	0	0	0	0	0
Outside	3	18	6	36	69	9	9	0	0	0	0	0	0	0	0	0
Portland, Oreg	318	417	86	29	86	17	9	14,266	340	494	168	74	77	333	175	211
Outside	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0
Total, 1931	1,115	1,617	215	124	260	40	45	14,266	340	494	168	74	77	333	175	211
Total, 1930	739	943	197	31	161	19	----	6,364	161	269	10	7	7	168	113	122
Eighth district:																
Detroit, Mich	388	4	10	40	35	3	4	2,057	18	29	255	20	28	105	48	49
Outside	0	4	4	60	116	25	10	0	0	0	0	0	0	0	0	0
Buffalo, N. Y	86	68	8	14	33	4	0	0	0	0	0	0	0	0	0	0
Outside	0	0	0	2	45	2	0	0	0	0	0	0	0	0	0	0
Total, 1931	474	76	22	116	229	34	14	2,057	18	29	255	20	28	105	48	49
Total, 1930	533	313	20	55	106	13	----	1,208	39	50	0	0	0	2	2	2
Ninth district:																
Chicago, Ill	139	321	19	20	28	3	4	3,494	26	40	191	21	24	13	3	3
Outside	2	8	3	42	282	34	1	0	0	0	0	0	0	0	0	0
St. Paul, Minn	0	0	0	8	0	0	0	1,623	13	30	0	0	0	16	5	8
Outside	0	2	0	28	57	29	0	0	0	0	0	0	0	0	0	0
Duluth, Minn	26	121	40	12	0	0	0	0	0	0	0	0	0	0	0	0
Outside	0	71	33	0	8	0	0	0	0	0	0	0	0	0	0	0
Kansas City, Mo	0	0	0	5	32	2	0	0	0	0	0	0	0	0	0	0
Outside	0	0	0	16	75	1	0	0	0	0	0	0	0	0	0	0
Denver, Colo	0	0	0	23	40	15	1	1,420	29	91	54	6	6	11	7	7
Outside	0	0	0	2	40	30	0	0	0	0	0	0	0	0	0	0
Total, 1931	167	523	95	156	562	114	6	6,537	68	161	245	27	30	40	15	18
Total, 1930	488	286	51	135	496	91	----	4,690	74	116	9	3	3	4	0	0
SUMMARY BY DISTRICTS																
First	1,285	193	147	31	41	28	0	12,884	76	133	2,125	628	650	517	174	181
Second	4,234	395	432	24	53	19	0	6,914	63	108	20	4	9	9	2	3
Third	1,854	68	36	52	166	17	0	3,894	146	207	1,123	68	81	330	90	106
Fourth	4	0	1	13	74	13	0	1,640	28	44	242	5	6	12	1	0
Fifth	587	187	145	55	183	31	0	9,608	148	257	381	17	19	161	44	55
Sixth	1,713	660	262	149	237	57	8	8,473	123	167	977	122	158	102	42	44
Seventh	1,115	1,617	215	124	260	40	45	14,266	340	494	168	74	77	333	175	211
Eighth	474	76	22	116	229	34	14	2,057	18	29	255	20	28	105	48	49
Ninth	167	523	95	156	562	114	6	6,537	68	161	245	27	30	40	15	18
Grand Island	0	0	0	0	0	0	0	1,757	61	108	483	41	44	789	129	151
Grand total, 1931	11,433	3,719	1,355	720	1,805	353	73	68,030	1,071	1,708	6,019	1,006	1,102	2,398	720	818
Grand total, 1930	11,334	3,026	1,287	445	1,452	251	----	44,923	1,162	1,623	302	100	130	470	214	265

Place of examination (city or town)	Operators examined								Operators licensed									Amateur stations licensed[2]
	Commercial						Amateur		Commercial						Amateur			
	Extra first	First	Second	Third[1]	Broadcast	Phone	Extra first	First	Extra first	First	Second	Third[1]	Broadcast	Phone	Extra first	First	Temporary	
First district:																		
Boston, Mass	1	117	348	1	21	15	8	385	2	139	227	1	18	15	13	840	570	346
Outside	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0
Total, 1931	1	117	348	1	21	15	8	405	2	139	227	1	18	15	13	840	570	346
Total, 1930	0	123	252	--	24	0	9	270	0	116	219	--	18	14	6	731	341	1,740
Second district:																		
New York, N. Y	3	309	471	10	36	19	36	802	3	400	485	9	32	20	34	1,122	130	467
Total, 1931	3	309	471	10	36	19	36	802	3	400	485	9	32	20	34	1,122	130	467
Total, 1930	1	668	394	--	32	6	12	557	11	551	460	--	17	6	6	849	104	1,890
Third district:																		
Baltimore, Md	0	24	63	0	20	1	0	78	1	53	64	0	13	0	4	387	212	226
Outside	0	0	0	0	0	0	4	35	0	0	0	0	0	0	0	0	0	0
Philadelphia, Pa	0	40	187	0	26	1	13	272	0	70	166	0	24	1	16	248	0	0
Norfolk, Va	1	9	19	1	12	0	0	24	0	19	20	0	6	1	0	29	0	0
Washington, D. C	0	8	57	0	26	4	2	46	2	22	60	0	21	5	3	57	0	0
Total, 1931	1	81	326	1	84	6	19	455	3	164	310	0	64	7	23	721	212	226
Total, 1930	0	91	202	--	52	3	17	315	0	189	230	--	39	2	12	626	160	1,292
Fourth district:																		
Atlanta, Ga	0	22	32	2	45	1	2	53	0	49	79	2	35	1	8	150	712	181
Outside	0	22	48	0	12	0	12	90	0	0	0	0	0	0	0	0	0	0
Total, 1931	0	44	80	2	57	1	14	143	0	49	79	2	35	1	8	150	712	181
Total, 1930	0	56	112	--	68	4	17	191	0	44	101	--	29	4	8	174	446	835
Fifth district:																		
New Orleans, La	2	27	187	1	24	1	1	40	5	176	297	5	27	3	9	193	814	261
Outside	0	6	107	5	21	0	5	127	0	0	0	0	0	0	0	0	0	0
Dallas, Tex	0	12	72	7	39	28	2	60	0	18	88	5	33	30	2	151	0	0
Outside	0	1	43	0	30	25	0	144	0	0	0	0	0	0	0	0	0	0
Total, 1931	2	46	409	13	114	54	8	371	5	194	385	10	60	33	11	344	814	261
Total, 1930	0	99	369	--	129	6	10	282	0	261	397	--	72	10	8	314	546	1,044
Sixth district:																		
San Francisco, Calif	2	184	238	6	25	110	7	372	8	205	246	6	14	170	23	1,073	359	836
Outside	1	1	6	0	13	63	5	62	0	0	0	0	0	0	0	0	0	0
Los Angeles, Calif	6	119	169	5	60	67	10	452	0	114	150	2	30	68	12	542	0	0
Outside	0	7	16	0	4	4	1	128	0	0	0	0	0	0	0	0	0	0
Total, 1931	9	311	429	11	102	244	23	1,014	8	319	396	8	44	238	35	1,615	359	836
Total, 1930	1	496	268	--	46	233	28	523	5	437	363	--	34	219	25	1,178	425	3,392
Seventh district:																		
Seattle, Wash	0	61	127	5	28	42	6	163	0	76	153	1	25	44	10	450	404	219
Outside	0	2	9	0	12	2	5	86	0	0	0	0	0	0	0	0	0	0
Portland, Oreg	0	24	133	0	22	12	3	145	0	38	87	0	16	26	3	144	0	0
Outside	0	1	3	0	1	15	0	8	0	0	0	0	0	0	0	0	0	0
Total, 1931	0	88	272	5	63	71	14	402	0	114	240	1	41	70	13	594	404	219
Total, 1930	0	183	214	--	53	17	7	232	0	161	183	--	41	10	3	355	255	1,097
Eighth district:																		
Detroit, Mich	0	18	122	6	83	25	6	162	0	66	209	7	57	75	15	831	1,897	654
Outside	0	8	90	2	59	29	25	470	0	0	0	0	0	0	0	0	0	0
Buffalo, N. Y	0	5	41	0	33	0	7	55	0	13	50	0	16	1	12	157	41	38
Outside	0	0	23	1	10	0	3	117	0	0	0	0	0	0	0	0	0	0
Total, 1931	0	31	276	9	185	54	41	804	0	79	259	7	73	76	27	988	1,938	692
Total, 1931	0	29	218	--	102	20	25	474	0	75	224	--	58	22	17	776	1,393	3,041

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[1] Established July 1, 1930.

[2] Issuance discontinued by Radio Division Sept. 30, 1930, and taken over by Federal Radio Commission Oct. 1, 1930.

Place of examination (city or town)	Operators examined								Operators licensed									Amateur stations licensed
	Commercial						Amateur		Commercial						Amateur			
	Extra first	First	Second	Third	Broadcast	Phone	Extra first	First	Extra first	First	Second	Third	Broadcast	Phone	Extra first	First	Temporary	
Ninth district:																		
Chicago, Ill	0	24	315	2	162	59	21	444	1	62	356	0	98	69	47	1, 505	1. 557	832
Outside	0	2	67	0	49	1	38	642	0	0	0	0	0	0	0	0	0	0
St. Paul, Minn	0	2	18	0	18	0	0	62	0	4	18	0	11	0	0	48	0	0
Duluth, Minn	0	0	11	1	9	0	0	22	0	6	14	1	4	0	0	24	0	0
Outside	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	28	0
Kansas City, Mo	0	6	48	4	43	5	7	72	0	15	52	1	21	5	7	204	0	0
Outside	0	1	31	0	18	2	2	117	0	0	0	0	0	0	0	0	0	0
Denver, Colo	0	1	15	1	21	8	3	73	0	4	16	1	13	9	2	98	0	0
Outside	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Total, 1931	0	36	505	8	320	75	71	1, 443	1	91	456	3	147	83	56	1, 789	1, 585	832
Total, 1930	0	62	450	..	242	32	60	964	0	98	365	..	122	48	44	1, 269	1, 470	4, 071
SUMMARY, BY DISTRICTS																		
First	1	117	348	1	21	15	8	405	2	139	227	1	18	15	13	840	570	346
Second	3	309	471	10	36	19	36	802	3	400	485	9	32	20	34	1, 122	130	467
Third	1	81	326	1	84	6	19	455	3	164	310	0	64	7	23	721	212	226
Fourth	0	44	80	2	57	1	14	143	0	49	79	2	35	1	8	150	712	181
Fifth	2	46	409	13	114	54	8	371	5	194	385	10	60	33	11	344	814	261
Sixth	9	311	429	11	102	244	23	1, 014	8	319	396	8	44	238	35	1, 615	359	836
Seventh	0	88	272	5	63	71	14	402	0	114	240	1	41	70	13	594	404	219
Eighth	0	31	276	9	185	54	41	804	0	79	259	7	73	76	27	988	1, 938	692
Ninth	0	36	505	8	320	75	71	1, 443	1	91	456	3	147	83	56	1, 879	1, 585	832
Grand total, 1931	16	1, 063	3, 116	60	982	539	234	5, 839	22	1, 549	2, 837	41	514	543	220	8, 253	6, 724	4, 060
Grand total, 1930	2	1, 807	2, 479	..	748	327	185	3, 808	16	1, 932	2, 542	..	430	335	129	6, 272	5, 140	18, 402

The following statement shows the detailed expenditures of the radio service for 1931; the appropriation and proposed allotment for the fiscal year 1932:

	1931	1932		1931	1932
Salaries:			General expenses—Contd.		
District of Columbia	$63, 641. 83	$82, 020	Rents	$26, 719. 00	$26, 865
Field	342, 996. 55	443, 500	Office supplies and stationery	4, 379. 00	4, 000
Total	406, 638. 38	525, 520	Communications	5, 487. 00	5, 015
			Miscellaneous	7, 620. 00	27, 000
General expenses:					
Travel and subsistence	31, 420. 00	25, 500	Total	502, 209. 38	646, 700
Furniture and fixtures, office	5, 950. 00	3, 500	Unobligated balance	629. 00	--------
Test cars and equipment	8, 989. 00	5, 400	Total appropriation [1]	[2] 502, 840. 00	646, 700
Technical instruments and supplies	5, 007. 00	23, 900			

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[1] In addition to the regular amount appropriated for 1931 ($500,000), by act of Congress, $30,000 was made available for construction work at Grand Island, Nebr.; $27,742.02 of the $30,000 has been expended.

[2] $2,840 is Brookhart Act, effective July 3, 1930.

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U. S. DEPARTMENT OF COMMERCE
ROY D. CHAPIN, Secretary
RADIO DIVISION
W. D. TERRELL, Director

Selection from

ANNUAL REPORT

OF THE

DIRECTOR OF RADIO DIVISION

TO THE

SECRETARY OF COMMERCE

FOR THE

FISCAL YEAR ENDED JUNE 30, 1932

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON: 1932

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RADIO DIVISION

Department of Commerce,
Radio Division,
Washington, July 1, 1932.

The honorable the Secretary of Commerce.

Dear Mr. Secretary: In response to your request I furnish the following condensed report of the work of the Radio Division during the past fiscal year, including references to related developments which have taken place during that period.

LEGISLATION

During the first session of the Seventy-second Congress 27 radio bills were introduced. Two of these bills affecting the duties of the Radio Division were passed, one denying radio operators' licenses to aliens, the other extending the provisions of the act of June 24, 1910, amended July 23, 1912, to the Canal Zone. In addition to the above the so-called economy act authorizes the President to transfer the duties, personnel, property, and appropriation of the Radio Division to the Federal Radio Commission.

RADIO INSPECTION SERVICE

The policy of giving special attention to the inspection of radio installations on ships has been continued during the past year. This duty is required by the act of June 24, 1910, amended July 23, 1912, the purpose of which is to promote safety of life at sea. As the law now reads it applies to steamers only. I renew my recommendation that this law be amended to read "vessel" instead of "steamer."

There has been a slight decrease in the number of clearances and inspection of ship stations. In 1931 there were 15,408 clearances from our ports of ships, foreign and domestic, which are required by law to be fitted with radio apparatus, of which 11,433 inspections were made. In 1932 there were 14,708 clearances and 11,125 inspections.

There were 3,352 inspections made of the radio stations on vessels not required by law to be equipped with radio. During the previous year 3,719 such inspections were made.

During 1932 there were 3,339 inspections made of radio stations on land, including aircraft broadcasting and amateur. The previous year 2,951 such inspections were made.

There was a slight decrease in defects found upon inspection of ship radio stations where clearance would have been in violation of law. For 1932 there were 265 as compared with 315 for 1931.

There has been a substantial increase in the number of radio operators examined and licensed. During the year examinations were given to 5,949 applicants for commercial licenses and 10,315 applicants for amateur licenses. The figures for the previous year were 5,776 commercial and 6,073 amateur. Licenses were issued to 27,211 radio operators during the year, of which 6,555 were commercial and 20,656 amateur. The previous year there were 5,506 commercial and 15,197 amateur, a total of 20,703. The foregoing figures include renewal licenses issued without reexamination.

During the past fiscal year 1,426 inspection trips were made and 610 cities visited. The previous year 1,135 such trips were made and 501 cities visited.

RADIO TEST CARS

Each of the nine radio districts, with the exception of New York, is supplied with a radio test car. Experience has demonstrated the value of these cars in meeting demands for this service. In no other way could much of the work be performed. One of these cars has had over 100,000 miles service. When changes are required, consideration will be given to change of design with a view to reducing weight and providing additional space for equipment. The service needs cars at New York, Los Angeles, and some mid-west point, possibly Kansas City.

FIELD SURVEY

In August the San Francisco supervisor of radio made a trip to Hawaii for the purpose of inspecting approximately 60 radio stations situated on the islands, observing radio operating conditions, and reporting on the need for a representative of our service to be assigned to Honolulu for permanent duty.

During the past fiscal year there were 331 clearances from the port of Hawaii of foreign and American vessels subject to the terms of the act of June 24, 1910, amended July 23, 1912, without inspection of the radio installations.

No provision has been made for measuring the frequencies used by radio transmitters used on the islands. Complaints of interference or of violations of the radio laws and regulations can not be given proper attention.

There are 96 amateur statious being operated by persons who have been given temporary operators' licenses without having passed the prescribed examination to obtain regular licenses. The supervisor reports:

> It is of paramount importance that an office be established in Honolulu as soon as it is possible to do so. Opinion was sought of numerous people, including representatives of the Army, Navy, commercial, amateur, etc., and it is the unanimous opinion that the need is great.

The need for supervision also exists in Alaska and Puerto Rico, though perhaps not to the same extent.

RADIOBEACONS AND RADIOCOMPASSES

Safety of navigation has been further increased through the installation of additional marine radiobeacons and radiocompasses. There are 102 marine radiobeacons in use in the United States at the present time, an increase of 12 over the preceding year. They are situated along the seacoast and around the Great Lakes.

The value of the radiocompass as an aid to navigation is indicated by the voluntary installation of this apparatus on 1,357 United States vessels, an increase of 23 during the past year. Such apparatus has also been installed on airships.

MEASUREMENT OF MODULATION

The field offices should be supplied with the most efficient type of apparatus with which to measure and record the modulation of radio stations. The use of such apparatus would produce results beneficial to the Federal Radio Commission, the station owners, and the public. The apparatus should be of a light, durable, and portable type, suitable for installation on the test cars.

RECEIVING SETS

According to the preliminary count of families having radio receiving sets, the Bureau of the Census reports of the 29,980,146 families in the United States in April, 1930, 12,078,345, or 40.3 per cent, had radio sets. The United States has approximately one-half of the receiving sets and one-half of the broadcasting stations in use in the world.

MONITORING REPORTS

During the past year the 10 monitoring stations reported 97,611 frequency measurements as compared with 76,447 the previous year. According to these reports 5,027 stations were found to be deviating from their assigned frequency, the total number of deviations being 5,953. The above figures include broadcasting, other than broadcasting, and foreign stations.

Effective June 22, 1932, the tolerance of 500 cycles, formerly permitted by the Federal Radio Commission as applicable to broadcasting stations, was reduced to 50 cycles. Reports indicate that stations are not finding it difficult to meet the more rigid requirement; however, it has been found necessary to install more precise equipment to accomplish the desired result. The new rule is improving reception conditions. Monitoring stations are essential in the enforcement of this rule.

AUTOMATIC ALARM SIGNAL DEVICE

Inspection of automatic alarm devices was continued during the past year. In this period 708 inspections were made of these instruments used exclusively on foreign vessels. There are 974 British vessels fitted with this type of apparatus. According to information furnished our inspectors by employees on the vessels inspected there were 599 false alarms recorded, due to signals not intended to actuate the device. Such signals are reported to be traceable to static, near-by radio signals, or other types of interference. Under the provisions of the International Radio Convention the device must respond to the alarm signal even when many stations are working and when there is atmospheric (static) interference; it is not to be actuated by strong signals or by atmospherics when these are not accompanied by the alarm signal. The reports mentioned above raised doubt as to the dependability of the devices in use or their fulfilling the requirements of the international rules.

During the past year the Radio Division had opportunity to observe tests of two types of automatic alarm devices, one of foreign and the other of American make. These tests were conducted on the Great Lakes and covered a period of three months. The American device responded satisfactorily and with a much higher percentage of recordings. It is not influenced by extraneous signals to any appreciable extent. Its dependability was almost perfect during these tests, many of which were made under severe static conditions, frequently over long distances, and partly over land. The device is actuated by the carrier of the transmitting station modulated at 25 cycles. It makes use of an automatic transmitter to produce the 25-cycle note. Hand transmission has recognized disadvantages.

RADIO FOR AVIATION

The use of radio as an aid to air navigation has become universal among the air-mail and passenger-carrying air-line operators in this country. With the exception of one company operating into central South America and Mexico, the message traffic is handled almost entirely by radiotelephone on medium-high frequency. The system is used entirely for safety and operational procedure.

The first installations were started two and one-half years ago and since that time have progressed continuously. At present there are 121 aeronautical ground radio stations and 350 aircraft radio stations. The aeronautical ground stations are located at or close to airports along the airways and maintain continuous contact with the aircraft. The pilot reports his position on either 20 or 30 minute schedules and receives and reports local weather conditions. All stations maintain continuous watch for distress calls.

The installation of this radio flight-control equipment has been made voluntarily by the air-transport operators. At present radio-equipped planes are averaging 134,154 miles, 1,534 passengers, and 23,963 pounds of mail per 24-hour day. Of the total daily mileage 40 per cent is at night. Schedules over a year's performance average approximately 92 per cent complete. During the months when better weather prevails averages as high as 98 per cent performance are registered. The radio has contributed to these high performance records.

POLICE RADIO

As an aid to law enforcement the use of radio is rapidly extending. Last year there were 53 radio stations used by police departments, while this year there are 79 such stations licensed and in operation and construction permits have been issued for 10 more. Police headquarters stations have a means of immediate contact with patrolmen in scouting cars through the use of radio which results in prompt action in any emergency and is a real public benefit.

AMATEURS

There has been an unprecedented increase in the users of amateur radio during the past year. Last year there were 22,739 licensed amateur transmitting stations. This year there are 30,374, an increase of 7,635. This army of amateurs have been operating their stations in an orderly manner, with very little official supervision and with very few violations of the law or regulations reported against them.

The trend in the technical design of amateur stations has been toward the emission of steadier, sharper signals rather than toward increase in power, and the result has been that amateur transmissions in general are now in accordance with the regulations, and compare favorably with those of other radio services. Not only has the use of piezo-electric crystal control been widely popularized, but many amateurs are achieving the practical limit in frequency stability by providing constant temperature control of these quartz crystals and often their associated apparatus. Such attention to technical detail is an attribute of the amateurs that is particularly worth while in view of their steadily increasing numbers.

Precision of frequency setting by amateurs has shown a steady improvement, largely as a result of this greater attention to technical detail and the inclusion of adequate frequency-determining devices in the equipment of amateur stations. The campaign for frequency observance fostered by the American Radio Relay League, combining the laboratory development of these technical measures together with the continuance of their system of standard frequency transmitting stations and a group of qualified official observers, has been responsible for remarkable improvement in this direction.

Changes in the amateur regulations made effective April 1, 1932, principally affected amateur radiotelephone operation, a constantly growing portion of the amateur art. The requirement for a special class of operator's license issued by the division to qualify an amateur for operation in certain of these bands was inaugurated for the purpose of bettering the general character of operation in these bands.

The most outstanding achievement by amateurs during the past year has been their development of the ultrahigh-frequency portion of the radio spectrum, particularly the band assigned to them from 56 to 60 megacycles. Originally begun in 1924, developmental work on apparatus received a fresh impetus in early 1931 which continued through the year, resulting in a great increase in the popularity of this band. Numerous portable amateur stations were erected on mountains and other high points for the elaborate tests conducted in this region, and in one instance amateur initiative resulted in securing a special experimental license for the operation of ultrahigh-frequency equipment in an airplane in flight. Distances of over 100 miles were covered in point-to-point 2-way communication on the ground on 60 megacycles, representing practically full utilization of the transmission characteristics of these high radio-frequencies.

As has been customary each year since 1923, amateurs cooperated with several expeditions during the fiscal year just ended, in some cases handling all communications for the party. In addition to several small local emergency communication feats, amateurs stepped into the breach created by the failure of normal communications facilities all along the Atlantic seaboard in the blizzards during March, 1932, and reestablished the broken communications links. United States Naval Reserve and Army-Amateur Radio System operation increased in numbers and variety of operation during the year.

INTERNATIONAL CONFERENCES

Much importance is attached to the forthcoming conference to be held in Madrid, Spain, beginning September 3, 1932, because of likelihood of combining the radiotelegraph and the telegraph conventions.

Heretofore these conferences have not been held jointly, although they had many problems in common and were attended to a large extent by the same personnel representing the various countries, parties to the two conventions. The United States, not being a party to the telegraph convention, has not heretofore participated officially in these conferences, although it did have observers at the last telegraph conference held in Paris in 1925.

It appears certain that an effort will be made at the Madrid conference to effect a reallocation of frequencies assigned to services. The European countries desire a widening of the bands for broadcasting, and as these demands tend to encroach on the marine-service allocations, it is expected there will be considerable discussion of this subject before a satisfactory solution can be reached. The representatives of the broadcasters and representatives of the marine service of the United States are not entirely in agreement on this question.

It is expected the conference will last at least three months, as consideration must be given to between 1,500 and 2,000 proposals submitted by the governments concerned covering changes desired and new subjects for incorporation in the new convention. At the Washington conference in 1927 there were 1,923 proposals submitted.

INTERNATIONAL RADIO ACCOUNTING

The international accounting activities are summarized as follows:

Accounts on hand July 1, 1931	431
Accounts received during year	1, 106
Total	1, 537
Accounts settled and cleared	864
Accounts on hand and unsettled	673

The financial operations were as follows:

Cash balance, July 1, 1931	$25, 970. 18
Collections	44, 732. 36
Total	70, 702. 54
Disbursements	41, 181. 24
Cash balance, July 1, 1932	29, 521. 30

The above summary shows 673 accounts on hand unsettled; 491 of these accounts have been audited and are in the process of collection; 182 accounts have been audited and are being billed.

During the past year this section has given considerable aid to American companies in the collection of their accounts from foreign administrations.

LEAVE AND OVERTIME

During the year the 159 employees in the field had an average of 18 days annual leave and an average of 3 days sick leave. The demands made upon these employees made it necessary that 90 of them work 3,338 days overtime, an average of 37 days each, during the year. Necessarily, much of this work was performed at night and of course without compensation.

Very truly yours,

W. D. Terrell,
Director of Radio.

STATISTICAL TABLES

Submitted below are statistics covering the division's work.

The following table shows the inspection and licensing work performed yearly from 1922 to 1932, inclusive, and the number of persons employed in the field force:

June 30—	American vessels equipped with radio	Inspections of American and foreign vessels		Frequency measurements of American and foreign stations	Licenses issued		Total field force
		Voluntary equipment	Compulsory equipment		Commercial operators	Amateur operators	
1922	2,773	869	6,071	....	3,136	8,920	35
1923	2,723	1,124	6,933	....	2,860	9,908	53
1924	2,741	1,577	7,727	....	3,370	9,545	53
1925	1,901	1,339	8,603	....	3,215	8,293	62
1926	1,954	1,583	9,197	....	3,398	8,140	65
1927	2,092	1,405	9,330	....	3,463	7,275	63
1928	2,166	1,659	9,093	....	3,816	8,369	78
1929	2,213	2,520	10,715	22,450	3,798	9,490	95
1930	2,173	3,026	11,334	45,695	5,255	11,541	131
1931	2,261	3,719	11,433	76,447	5,506	15,197	140
1932	2,160	3,352	11,125	97,611	6,555	20,656	159

DETAILED WORK

The following statement shows the details of the work performed during the past fiscal year compared with 1931 and the total number of licensed and Government radio stations:

Work of service	1931	1932
Clearances of American and foreign vessels required by law to be equipped with radio	15,408	14,708
Inspections of radio equipment on American and foreign vessels required by law to be equipped with radio	11,433	11,125
Inspections of radio equipment on voluntarily equipped vessels	3,719	3,352
American ship radio stations inspected for license	1,355	1,275
Land stations inspected	720	1,184
Broadcasting stations inspected	1,805	1,193
Aircraft stations inspected	73	266
Amateur stations inspected	353	696
Frequency measurements of American and foreign stations	76,447	97,611
Commercial operators examined	5,776	5,949
Commercial operators licensed	5,506	6,555
Amateur operators examined	6,073	10,315
Amateur operators licensed	15,197	20,656
Defects found upon inspection of ship radio stations where clearance would have been in violation of law	315	265
Licensed and Government radio stations: [1]		
American vessels equipped with radio	2,261	2,160
General and special experimental, relay broadcasting, visual broadcasting	231	230
Commercial land stations [2]	628	820
Broadcasting stations [2]	613	608
Broadcast pick-up stations [3]	....	17
Commercial aircraft stations	303	355
Geophysical stations [2]	113	115
Amateur stations	22,739	30,374
Government land stations	420	427
Government ship stations	1,046	1,037

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[1] Philippine stations not included.

[2] A number of stations for which construction permits have been issued but not licensed for operation up to June 30, 1931, are not included in these figures.

[3] Included in experimental, etc., for 1931.

OPERATORS LICENSED

The following table shows the number of radio operators licensed during the past two years:

Class and grade	1931	1932	Class and grade	1931	1932
Commercial extra first class	22	16	Aeronautical	------	199
Commercial first class	1,549	2,088	Amateur extra first grade	220	333
Commercial second class	2,837	2,615	Amateur first grade	8,253	11,686
Commercial third class	41	87	Amateur (temporary)	6,724	8,637
Broadcast class	514	902			
Phone class	543	648	Total	20,703	27,211

FIELD ACTIVITIES

Following is a statement, by districts, of the work performed during the past fiscal year compared with the previous year:

Place of inspection (city or town)	Stations inspected							Frequency measurements								
								United States Broadcast			United States other than broadcast			Foreign		
	Ship, under act	Ship, voluntary equipment	Ship for license	Land [1]	Broadcast	Amateur	Aircraft	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations
First district:																
Boston, Mass	1,185	198	168	3	3	16	1	10,559	43	93	2,360	400	464	361	114	128
Outside	0	14	12	14	39	32	0	0	0	0	0	0	0	0	0	0
Total, 1932	1,185	212	180	17	42	48	1	10,559	43	93	2,360	400	464	361	114	128
Total, 1931	1,285	193	147	31	41	28	0	12,884	76	133	2,125	628	650	517	174	181
Second district:																
New York, N. Y	4,095	372	395	31	139	53	1	0	0	0	0	0	0	0	0	0
Outside	0	0	0	27	107	94	0	0	0	0	0	0	0	0	0	0
Total, 1932[1]	4,095	372	395	58	246	147	1	0	0	0	0	0	0	0	0	0
Total, 1931	4,234	395	432	24	53	19	0	6,914	63	108	20	4	9	9	2	3
Third district:																
Baltimore, Md	405	24	18	0	6	9	0	3,326	89	177	711	19	25	119	59	65
Outside	0	0	0	7	37	36	2	0	0	0	1	1	1	0	0	0
Philadelphia, Pa	444	60	16	4	62	28	0	0	0	0	0	0	0	0	0	0
Outside	13	2	2	10	16	20	0	0	0	0	0	0	0	0	0	0
Norfolk, Va	780	117	39	1	25	8	1	0	0	0	0	0	0	0	0	0
Outside	0	0	0	1	9	9	0	0	0	0	0	0	0	0	0	0
Total, 1932	1,642	203	75	23	155	110	3	3,326	89	177	712	20	26	119	59	65
Total, 1931	1,854	68	36	52	166	17	0	3,894	146	207	1,123	68	81	330	90	106
Fourth district:																
Atlanta, Ga	0	0	0	2	6	2	2	2,110	31	71	247	5	14	41	2	3
Outside	0	0	0	66	74	16	7	0	0	0	0	0	0	0	0	0
Miami, Fla	183	23	1	10	9	24	14	0	0	0	0	0	0	0	0	0
Outside	4	0	0	6	3	1	0	0	0	0	0	0	0	0	0	0
Total, 1932	187	23	1	84	92	43	23	2,110	31	71	247	5	14	41	2	3
Total, 1931	4	0	1	13	74	13	0	1,640	28	44	242	5	6	12	1	0
Fifth district:																
New Orleans, La	514	155	89	14	30	1	4	6,521	19	34	762	34	35	142	24	24
Outside	12	26	21	36	97	32	6	0	0	0	0	0	0	0	0	0
Dallas, Tex	0	0	0	7	19	3	0	288	0	0	15	0	0	0	0	0
Outside	0	0	0	15	74	10	0	0	0	0	0	0	0	0	0	0
Total, 1932	526	181	110	72	220	46	10	6,809	19	34	777	34	35	142	24	24
Total, 1931	587	187	145	55	183	31	0	9,608	148	257	381	17	19	161	44	55

[1] Frequency measurements discontinued during this year.

Place of inspection (city or town)	Stations inspected							Frequency measurements								
								United States Broadcast			United States other than broadcast			Foreign		
	Ship, under act	Ship, voluntary equipment	Ship for license	Land [1]	Broadcast	Amateur	Aircraft	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations	Measurements	Stations deviating	Deviations
Sixth district:																
San Francisco, Calif	1,355	318	248	13	49	16	0	5,361	66	131	926	91	97	172	57	57
Outside	6	7	10	181	115	14	2	0	0	0	0	0	0	0	0	0
Los Angeles, Calif	733	168	25	6	14	3	0	4,466	15	33	1,489	238	277	217	38	39
Outside	1	17	11	36	46	11	0	0	0	0	0	0	0	0	0	0
Total, 1932	2,095	510	294	236	224	44	2	9,827	81	164	2,415	329	374	389	95	96
Total, 1931	1,713	660	262	149	237	57	8	8,473	123	167	977	122	158	102	42	44
Seventh district:																
Seattle, Wash	609	1,067	154	52	79	14	30	0	0	0	0	0	0	0	0	0
Outside	1	11	8	112	74	18	21	0	0	0	0	0	0	0	0	0
Portland, Oreg	225	244	12	57	90	14	9	13,979	52	134	1,573	202	204	880	209	222
Outside	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total, 1932	835	1,322	174	221	243	46	60	13,979	52	134	1,573	202	204	880	209	222
Total, 1931	1,115	1,617	215	124	260	40	45	14,266	340	494	168	74	77	333	175	211
Eighth district:																
Detroit, Mich	313	2	5	40	31	8	2	4,479	33	49	277	38	55	249	86	89
Outside	2	15	10	98	131	48	13	0	0	0	0	0	0	0	0	0
Buffalo, N. Y	98	78	3	35	71	21	6	0	0	0	0	0	0	0	0	0
Outside	0	3	3	8	35	9	0	0	0	0	0	0	0	0	0	0
Total, 1932	413	98	21	181	268	86	21	4,479	33	49	277	38	55	249	86	89
Total, 1931	474	76	22	116	229	34	14	2,057	18	29	255	20	28	105	48	49
Ninth district:																
Chicago, Ill	126	241	8	41	40	7	15	5,693	36	67	510	20	26	31	1	1
Outside	0	2	0	87	174	28	19	35	0	0	3	0	0	0	0	0
St. Paul, Minn	0	0	0	20	10	9	2	1,132	2	4	3	0	0	11	5	5
Outside	0	2	2	45	86	40	4	0	0	0	0	0	0	0	0	0
Duluth, Minn	21	184	14	20	0	2	2	0	0	0	0	0	0	0	0	0
Outside	0	2	1	3	11	1	0	0	0	0	0	0	0	0	0	0
Kansas City, Mo	0	0	0	20	26	5	0	0	0	0	0	0	0	0	0	0
Outside	0	0	0	25	78	5	0	0	0	0	0	0	0	0	0	0
Denver, Colo	0	0	0	25	33	11	1	228	3	14	147	12	14	3	0	0
Outside	0	0	0	3	45	18	2	0	0	0	0	0	0	0	0	0
Total, 1932	147	431	25	289	503	126	45	7,088	41	85	663	32	40	45	6	6
Total, 1931	167	523	95	156	562	114	6	6,537	68	161	245	27	30	40	15	8
Grand Island, 1932	0	0	0	0	0	0	0	8,718	491	951	17,738	2,138	2,377	12,978	720	818
Grand Island, 1931	0	0	0	0	0	0	0	1,757	61	108	483	41	44	789	129	151
SUMMARY BY DISTRICTS																
First	1,185	212	180	17	42	48	1	10,559	43	93	2,360	400	464	361	114	128
Second [1]	4,095	372	395	58	246	147	1	0	0	0	0	0	0	0	0	0
Third	1,642	203	75	23	155	110	3	3,326	89	177	712	20	26	119	59	65
Fourth	187	23	1	84	92	43	23	2,110	31	71	247	5	14	41	2	3
Fifth	526	181	110	72	220	46	10	6,809	19	34	777	34	35	142	24	24
Sixth	2,095	510	294	236	224	44	2	9,827	81	164	2,415	329	374	389	95	96
Seventh	835	1,322	174	221	243	46	60	13,979	52	134	1,573	202	204	880	209	222
Eighth	413	98	21	181	268	86	21	4,479	33	49	277	38	55	249	86	89
Ninth	147	431	25	289	503	126	45	7,088	41	85	663	32	40	45	6	6
Grand Island	0	0	0	0	0	0	0	8,718	102	144	8,714	1,078	1,165	10,752	1,803	1,992
Grand total, 1932	11,125	3,352	1,275	1,181	1,993	696	266	66,895	491	951	17,738	2,138	2,377	12,978	2,398	2,625
Grand total, 1931	11,433	3,719	1,355	720	1,805	353	73	68,030	1,071	1,708	6,019	1,006	1,102	2,398	720	818

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[1] Frequency measurements discontinued during this year.

Place of examination (city or town)	Operators examined									Operators licensed									
	Commercial						Aeronautical[1]	Amateur		Commercial						Aeronautical[1]	Amateur		
	Extra first	First	Second	Third	Broadcast	Phone		Extra first	First	Extra first	First	Second	Third	Broadcast	Phone		Extra first	First	Temporary
First district:																			
Boston, Mass	0	96	352	6	88	23	1	19	764	1	181	208	3	67	27	1	21	1,214	951
Outside	0	0	0	0	0	0	0	1	68	0	0	0	0	0	0	0	0	0	0
Total 1932	0	96	352	6	88	23	1	20	832	1	181	208	3	67	27	1	21	1,214	951
Total 1931	1	117	348	1	21	15	0	8	405	2	139	227	1	18	15	0	13	840	570
Second district:																			
New York, N. Y	2	154	289	13	79	34	10	23	1,162	10	502	333	6	64	34	5	26	1,511	167
Outside	0	1	0	0	1	0	0	2	49	0	0	0	0	0	0	0	0	0	0
Total, 1932	2	155	289	13	80	34	10	25	1,211	10	502	333	6	64	34	5	26	1,511	167
Total, 1931	3	309	471	10	36	19	0	36	802	3	400	485	9	32	20	0	34	1,122	130
Third district:																			
Baltimore, Md	1	13	34	2	11	3	1	2	154	0	85	61	0	16	2	0	14	564	224
Outside	0	0	1	1	0	0	0	0	71	0	0	0	0	0	0	0	0	0	0
Philadelphia, Pa	0	16	117	6	32	0	1	10	422	0	77	104	1	22	0	0	7	370	0
Outside	0	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0	0	0	0
Norfolk, Va	1	8	18	1	7	0	0	1	48	0	41	24	0	8	0	0	2	72	0
Outside	0	0	1	0	1	0	3	1	39	0	0	0	0	0	0	0	0	0	0
Washington, D. C	0	8	26	0	25	32	2	4	98	0	25	30	0	16	31	2	6	86	0
Total, 1932	2	45	197	10	76	35	7	18	878	0	228	219	1	62	33	2	29	1,092	224
Total, 1931	1	81	326	1	84	6	0	19	455	3	164	310	0	64	7	0	23	721	212
Fourth district:																			
Atlanta, Ga	0	8	35	3	40	23	16	3	174	0	48	99	3	52	31	26	7	260	828
Outside	0	0	35	0	23	4	70	12	194	0	0	0	0	0	0	0	0	0	0
Miami, Fla	0	8	20	16	0	0	3	2	34	0	32	27	11	0	0	0	2	45	0
Outside	0	0	1	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0
Total, 1932	0	16	91	19	63	27	89	17	422	0	80	126	14	52	31	26	9	305	828
Total, 1931	0	44	80	2	57	1	0	14	143	0	49	79	2	35	1	0	8	150	712
Fifth district:																			
New Orleans, La	1	20	121	1	36	14	10	6	77	0	233	257	8	67	15	2	27	337	1,020
Outside	0	3	123	13	49	1	13	24	226	0	0	0	0	0	0	0	0	0	0
Dallas, Tex	0	8	97	0	73	58	35	9	95	0	18	155	1	77	59	14	19	243	0
Outside	0	1	82	1	40	3	39	10	153	0	0	0	0	0	0	0	0	0	0
Total, 1932	1	32	423	15	198	76	97	49	551	0	251	412	9	144	74	16	46	580	1,020
Total, 1931	2	46	409	13	114	54	0	8	371	5	194	385	10	60	33	0	11	344	814
Sixth district:																			
San Francisco, Calif	1	102	207	24	51	68	9	15	503	5	325	224	20	54	97	11	34	1,195	394
Outside	0	4	18	2	27	4	0	14	275	0	0	0	0	0	0	0	0	0	0
Los Angeles, Calif	0	57	170	6	66	29	11	15	632	0	124	159	4	37	44	0	17	736	0
Outside	0	3	13	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	0
Total, 1932	1	166	408	32	144	101	20	44	1,485	5	449	383	24	91	141	11	51	1,931	394
Total, 1931	9	311	429	11	102	244	0	23	1,014	8	319	396	8	44	238	0	35	1,615	359
Seventh district:																			
Seattle, Wash	0	27	99	5	20	15	5	6	277	0	129	131	3	41	28	4	23	587	617
Outside	0	7	15	3	13	14	1	20	221	0	0	0	0	0	0	0	0	0	0
Portland, Oreg	1	17	75	3	29	9	3	1	198	0	44	58	2	18	9	3	2	184	0
Outside	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total, 1932	1	51	189	11	62	38	9	27	696	0	173	189	5	59	37	7	25	771	617
Total, 1931	0	88	272	5	63	71	0	14	402	0	114	240	1	41	70	0	13	594	404
Eighth district:																			
Detroit, Mich	0	12	93	13	70	20	6	6	244	0	75	179	15	105	76	8	32	1,210	2,127
Outside	0	23	125	6	99	59	18	25	1,012	0	0	0	0	0	0	0	0	0	0
Buffalo, N. Y	0	4	28	0	24	0	4	2	128	0	18	45	1	29	0	0	9	454	203
Outside	0	0	23	2	20	0	0	13	358	0	0	0	0	0	0	0	0	0	0
Total, 1932	0	39	269	21	213	79	28	46	1,742	0	93	224	16	134	76	8	41	1,664	2,330
Total, 1931	0	31	276	9	185	54	0	41	801	0	79	259	7	73	76	0	27	988	1,938

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[1] Established fiscal year 1932.

Place of examination (city or town)	Operators examined									Operators licensed									
	Commercial						Aeronautical	Amateur		Commercial						Aeronautical	Amateur		
	Extra first	First	Second	Third	Broadcast	Phone		Extra first	First	Extra first	First	Second	Third	Broadcast	Phone		Extra first	First	Temporary
Ninth district:																			
Chicago, Ill	0	23	314	12	178	79	41	20	791	0	80	414	6	135	106	13	53	1,922	2,106
Outside	0	15	84	5	43	0	173	25	500	0	0	0	0	0	0	0	0	0	0
St. Paul, Minn	0	8	16	0	25	19	8	1	120	0	12	24	0	14	19	4	7	132	0
Outside	0	0	9	0	10	0	0	11	149	0	0	0	0	0	0	0	0	0	0
Duluth, Minn	0	1	7	0	6	2	4	4	25	0	4	7	0	5	3	1	6	45	0
Outside	0	0	0	0	1	1	4	4	30	0	0	0	0	0	0	0	0	0	0
Kansas City, Mo	0	3	38	1	71	15	8	4	99	0	27	57	3	43	36	5	17	411	0
Outside	0	1	54	10	24	7	4	17	344	0	0	0	0	0	0	0	0	0	0
Denver, Colo	0	2	16	1	24	25	7	1	94	0	8	19	0	32	31	0	2	108	0
Outside	0	0	0	0	0	0	0	1	12	0	0	0	0	0	0	0	0	0	0
Total, 1932	0	53	538	29	582	148	249	88	2,164	0	131	521	9	229	195	123	85	2,618	2,106
Total, 1931	0	36	505	8	320	75	0	71	1,443	1	91	456	3	147	83	0	56	1,789	1,585
SUMMARY BY DISTRICTS																			
First	0	96	352	6	88	23	1	10	832	1	181	208	3	67	27	1	21	1,214	951
Second	2	155	289	13	80	34	10	25	1,211	10	502	333	6	64	34	5	26	1,511	167
Third	2	45	197	10	76	35	7	18	878	0	228	219	1	62	33	2	29	1,092	224
Fourth	0	16	91	19	63	27	89	17	422	0	80	126	14	52	31	26	9	305	828
Fifth	1	32	423	15	198	76	97	49	551	0	251	412	9	144	74	16	46	580	1,020
Sixth	1	166	408	32	144	101	10	44	1,485	5	449	383	24	91	141	11	51	1,931	394
Seventh	1	51	189	11	62	38	9	27	696	0	173	189	5	59	37	7	25	771	617
Eighth	0	39	269	21	213	79	28	46	1,742	0	93	224	16	134	76	8	41	1,664	2,330
Ninth	0	53	538	29	382	148	249	88	2,164	0	131	521	9	229	195	123	85	2,618	2,106
Grand total, 1932	7	653	2,756	156	1,306	561	510	334	9,981	16	2,088	2,615	87	902	648	199	333	11,686	8,637
Grand total, 1931	16	1,063	3,116	60	982	539	0	234	5,839	22	1,549	2,837	41	514	543	0	220	8,253	6,724

COST OF RADIO SERVICE

The following statement shows the detailed expenditures of the radio service for 1932.

	1932		1932
Salaries:		General expenses—Continued.	
District of Columbia	$67,271.34	Office supplies and stationery	$11,503.28
Field	382,677.80	Communications	6,268.39
Total	449,949.14	Heat, light, power, water, and electric service	2,906.15
General expenses:		Miscellaneous	1,796.31
Travel and subsistence	27,346.59	Total	551,912.45
Furniture and fixtures, office	4,044.61	Unexpended balance	94,787.55
Test cars and equipment	5,445.04	Total appropriation	646,700.00
Technical instruments and supplies	17,217.86		
Rents	25,435.08		

○

RECOMMENDATIONS OF THE NATIONAL RADIO COMMITTEE

RADIO SERVICE BULLETIN

ISSUED MONTHLY BY BUREAU OF NAVIGATION, DEPARTMENT OF COMMERCE

Washington, April 2, 1923—No. 72

MISCELLANEOUS.

RECOMMENDATIONS OF THE NATIONAL RADIO COMMITTEE.

Secretary Hoover stated that the recommendations by the radio conference represent a step in ideal development of measures for the prevention of interference in public broadcasting.

The report recommends making available all wave lengths from 222 to 545 meters for public broadcasting, the various possible bands to be assigned to different stations, so as not only to reduce direct interference but also to build up zonal regions of distribution.

The department fully accepts the recommendations of the conference, but there are a number of difficulties in placing the plan abruptly into action. First, the hardship that it may cause to various stations to move arbitrarily to new wave lengths. Second, the difficulties introduced by the ship-to-shore communication which is now working to some extent on 300 meters and also on 450 meters.

The conference recommended that the ultimate development for ship communication be to assign for the general purpose of shipping the whole wave area from 600 to

800 meters, different bands being allotted within this area for different shipping purposes. The distress signals from ships now work on 600 meters, and the radio compass works on 800 meters. The ship-to-shore communications on 300 and 450 meters are altogether commercial traffic and would be more advantageously carried on with less interruption than to-day if these services were given the entire field around 700 meters.

In order to make progress in this direction of developing the area from 600 to 800 for ship communication it is proposed that all ships and all shore stations used for ship communications shall cease using 450 meters between the hours of 7 and 11 p. m., but may use 700 meters at this or any other time. The 300 meters wave length now assigned under the international convention is very little used and will be used for inland broadcasting, and it is not expected that the ships will avail themselves of the international agreement in this particular, as it has not proved of practical advantage except to a limited extent.

For internal broadcasting the department proposes to cooperate with the various stations with a view to developing a systematic assignment of wave lengths to the various stations within the broad confines of the recommendations of the conference. In order to carry this out without hardship the following classification of stations will be made:

Class A stations (that is, stations equipped to use power not exceeding 500 watts).—In this class it is proposed that the radio inspectors, in cooperation with the station owners, shall assign distinctive wave lengths to each station so far as is possible in the area from 222 to 300 meters. No station will be required to change from 360 unless it so desires.

Class B stations (that is, stations equipped to use from 500 to 1,000 watts).—In this class it is proposed to similarly offer to license these stations on special wave lengths from 300 to 345 and from 375 to 545 meters, having regard to the maintenance of some ship work on 450 meters as outlined above, and again no station will be required to change from 360 unless it so desires.

Class C stations (comprising all stations now licensed for 360 meters).—In this class no new licenses will be issued for stations on 360 meters until the plan is entirely realized. Stations which do not wish to move under the general plan may remain at 360 meters, but they will necessarily be subject to some interference at best. It is thought that by the above plan the stations can be gradually brought into accord without hardships.

Under the plan amateurs are given the whole area from 150 to 220, instead of being fixed upon 200, with special licenses at 375. The special licenses hitherto issued for amateurs at 375 will now be issued at 220. Certain special cases will be taken care of otherwise. It is proposed, in cooperation with the amateur associations, to develop an assignment of wave bands in classifications, so as to somewhat relieve the present interference among amateurs. It will be remembered that the number of wave bands which can be used among the short-wave area assigned to the amateurs is greater in proportion than among the longer wave lengths, and these arrangements expand the area hitherto assigned to amateurs. The full recommendations of the conference are appended hereto.

This conference was called by Secretary Hoover to consider what can be done from an administrative point of view to lessen the amount of interference in radio broadcasting. The meetings were held at the Department of Commerce on March 20 to 24, 1923.

The members of the conference were as follows. The representatives of the Government departments were designated by the several departments, and the other members were appointed by the Secretary of Commerce: Maj. Gen. George O. Squier, War Department; Com. D. C. Bingham, United States Navy, Navy Department; W. A. Wheeler, Department of Agriculture; John W. Sutherin, Post Office Department; L. J. Heath, Treasury Department; F. P. Guthrie, United States Shipping Board; Edwin H. Armstrong, Columbia University, New York; Dr. Alfred N. Goldsmith, secretary, Institute of Radio Engineers; Prof. L. A. Hazeltine, Stevens Institute of Technology; John V. L. Hogan, consulting radio engineer, New York; C. B. Cooper, C. B. Cooper Co., New York; Hiram Percy Maxim, president American Radio Relay League; Prof. C. M. Jansky, University of Minnesota; A. H. Griswold, American Telegraph & Telephone Co.; Leo Fitzpatrick, radio editor, Kansas City Star; D. B. Carson, Department of Commerce, Bureau of Navigation; W. D. Terrell, Department of Commerce, Bureau of Navigation; J. H. Dellinger, Department of Commerce, Bureau of Standards; L. E. Whittemore, Department of Commerce, Bureau of Standards.

RECOMMENDED WAVE ALLOCATIONS.

It is recommended that radio stations be assigned specific wave frequencies (wave lengths) within the wave band corresponding to the service rendered as given in the following table. Throughout this report both wave frequency and wave lengths are given. Wave length in meters is 300,000 divided by wave frequency in kilocycles per second. It is recommended that wave bands marked "exclusive" be used for no other type of service; those marked "nonexclusive" can be used for other types of radio communication, as indicated.

Wave frequency in kilocycles per second.	Wave length in meters.	Service.
Above.	*Below.*	
2,300	130	Reserved (see note 1).
2,300	130	Government, CW, exclusive.
2,300	130	Reserved (see note 1).
2,100	143	
2,100	143	Government, CW, exclusive.
2,100	143	Reserved (see note 1).
2,000	150	
2,000	150	Amateur, CW, ICW, Ph, exclusive.
1,700	176	
1,700	176	Amateur, CW, ICW, Ph, Spk, exclusive.
1,500	200	
1,500	200	Special amateur and technical and training schools, CW, exclusive.
1,350	222	
1,350	222	Aircraft, CW, ICW, Ph, nonexclusive.
1,300	231	
1,350	222	Class B broadcasting, Ph, nonexclusive (see note 2).
1,050	286	
1,050	286	Reserved.
1,040	288	
1,040	288	Class A broadcasting, Ph, exclusive (see note 3).
1,000	300	
1,000	300	Marine, CW, ICW, Spk, nonexclusive (see note 4).
1,000	300	Class A broadcasting, Ph., exclusive (see note 3).
667	450	
667	450	Marine, CW, ICW, Spk, exclusive (see note 5).
667	450	Class A broadcasting, Ph, exclusive (see note 3).
550	545	
550	545	Marine and aircraft, CW, ICW, Spk, exclusive.
500	600	
500	600	Marine and aircraft, CW, ICW, exclusive (see note 4).
500	600	Marine and aircraft, CW, ICW, Spk, exclusive.
445	674	
Above.	*Below.*	
445	674	Government, CW, nonexclusive.
445	674	Marine and aircraft, CW, ICW, Spk, exclusive.
375	800	
375	800	Radio compass, CW, ICW, Spk, exclusive.
375	800	Marine, Ph, exclusive.
315	952	
315	952	Government, CW, ICW, Spk, exclusive.
315	952	Reserved.
300	1,000	
300	1,000	Radio beacons, CW, ICW, Spk, exclusive.
300	1,000	Reserved.
285	1,053	
285	1,053	Marine, Ph, exclusive.
275	1,091	
275	1,091	Government, CW, ICW, nonexclusive.
275	1,091	Marine, Ph, exclusive.
250	1,200	
250	1,200	Government, CW, ICW, nonexclusive.
250	1,200	Marine, Ph, exclusive.
235	1,277	
235	1,277	University, college, and experimental, CW, ICW, exclusive.
230	1,304	
230	1,304	Government, CW, ICW, Spk, exclusive.
190	1,579	
190	1,579	Marine and point-to-point, non-Government, CW, ICW, Spk, exclusive.
120	2,500	
120	2,500	Government, CW, ICW, Spk, exclusive.
95	3,158	

NOTE 1.—Available for special licensing by the Department of Commerce.

NOTE 2.—Not more than six CW amateur stations to be licensed to use wave frequencies above 1,050 kc./s. (wave lengths below 286 meters) for communication across natural barriers.

NOTE 3.—A class A broadcasting station is a station of sufficient power to serve an extensive territory. Fifty territorial wave frequencies approximately 10 kc./s. apart are to be assigned by the Department of Commerce to local areas throughout the United States without duplication. The 10 such areas within each of 5 national zones are to have wave frequencies separated by approximately 50 kc./s.

NOTE 4.—The 1,000 and 500 kc./s. (300 and 600 meters) waves are for calling and distress purposes, with a minimum of traffic.

NOTE 5.—Mobile service on the 667 kc./s. (450 meters) wave is to be stopped between 7 and 11 p. m., local standard time, and to be transferred in so far and as soon as practicable to wave frequencies below 500 kc./s. (wave lengths above 600 meters).

RESOLUTIONS.

That this conference, and the Department of Commerce subsequently, follow the practice of expressing wave frequency in kilocycles per second, with wave length in meters in parentheses thereafter.

That in assigning a wave band of 10,000 cycles to each class A broadcasting station they be distributed over five zones throughout the country, such that no stations in adjacent zones are closer together in frequency than 20 kilocycles, and that within each zone there be 10 stations separated by 50 kilocycles.

That only one wave frequency be assigned to a class A broadcasting station, which should transmit exclusively on the wave frequency designated and reserved exclusively for that station.

That every broadcasting station should be equipped with apparatus such as a tuned circuit coupled to the antenna and containing an indicating instrument or the equivalent for the purpose of maintaining the operating wave frequency within 2 kilocycles of the assigned wave frequency.

That the Department of Commerce establish qualifications for class A broadcasting stations, including a general minimum and locally suitable maximum power and a quality of program that will warrant assignment of a territorial wave frequency to each particular station, and that the qualifications be similar to those required of the present class B broadcasting stations.

That the Department of Commerce in its discretion assign class B broadcasting station licenses in which wave frequencies shall be specified and in which the power ratio between the class A and B stations shall be at least two in so far as is practical for a given locality.

That in granting licenses it is recommended that the Department of Commerce limit the use of power where undue interference would otherwise be caused.

That reading of telegrams or letters by broadcasting stations be not construed as point-to-point communication so long as the signer is not addressed in person and so long as the text matter is of general interest.

That simultaneous rebroadcasting shall be permitted only on a broadcasting wave frequency and with the authorization of the original broadcaster and of the Department of Commerce.

That the Department of Commerce be requested to insist upon the suppression of harmonic and other parasitic radiation from all radio stations: as, for example, by requiring the installation, if necessary, of coupled circuit transmitters at the earliest feasible date.

That spark-transmitting apparatus be replaced as rapidly as practicable by apparatus which will produce a minimum of interference.

That the amateur organizations of the United States study the time requirements of the broadcasting of religious services on Sunday and by mutual arrangement with the broadcasters determine upon silent periods which will make possible the reception of such religious services in any given locality.

That when the Government conducts services similar to commercial services for which waves or wave bands have been assigned the Government stations shall use the said waves or wave bands.

That the Government have the exclusive use of a band 1 kilocycle wide centered at each of the following frequencies: 92, 83, 81, 78, and 76 kilocycles, so far as is consistent with public service generally.

That where a line-radio installation produces interference with the reception of signals from beyond the State such line-radio station shall require a license from the Department of Commerce.

That the subject of interference caused by devices not used for radio communication purposes and which are not subject to the present radio law be referred to the projected sectional committee of the American Engineering Standards Committee, and that in the meantime the members of the conference offer to the Department of Commerce their cooperation in the solution of such immediate problems as may be of a character in which their aid could be of value.

That, in the judgment of the Second National Radio Conference, the prevention of "willful or malicious interference," as provided for by section 5 of the act of August 13, 1912, and the minimization of interference, as provided for by article 8 of the International Convention, require that the Department of Commerce shall, in its discretion, withhold or rescind station licenses to transmit on specified wave frequencies at certain times and on definite powers and with certain types of transmitters and when, in the judgment of the Department of Commerce, such interference would result or does result; and that it is the clear and manifest intent of section 1 through 4, and regulations 10, 12, and 18 of section 4 of the said act to give the Department of Commerce such authority to withhold or rescind licenses where such interference will result or does result; and that the Second National Radio Conference believes that a decison by the courts validating the above views will be greatly in the public interest; and that the Second National Radio Conference expresses its willingness to advise and assist the Department of Commerce in the support of the above resolutions in the event of litigation.

That a copy of the foregoing motion be sent to each concern, organization, or association engaged in manufacture of radio equipment or broadcasting by radio or otherwise interested in radio communication with a request for an expression of approval or disapproval of the motion and an agreement to abide by its provisions.

That the Second National Radio Conference desires to emphasize the limited facilities available for radio broadcasting and the uneconomic and tentative basis of present-day broadcasting, and that the conference urges the consolidation in each locality of those desiring the establishment or maintenance of broadcasting and those interested in broadcasting in that locality, to the end that broadcasting conducted in each neighborhood by such a local association will receive public support and be handled in an economic and permanent fashion.

That the great expansion of radio communication has not been accompanied by a proportional increase in the radio personnel and facilities at the disposal of the Bureaus of Navigation and Standards of the Department of Commerce, and that the resulting strain on the inspection and technical forces of the Department of Commerce has been excessive, and has even forced the omission of important activities and investigations, and that the Second National Radio Conference strongly recommends that additional appropriations be granted to the Department of Commerce for its radio inspection personnel and equipment and for its research personnel and facilities; that a committee of three be appointed to wait upon the Secretary of Commerce to present the urgency of this need and the importance of the early provision of funds for these bureaus.

That the present conditions of radio interference with nonlocal reception and the resulting public dissatisfaction urgently require that the recommendations of the conference be accepted by the Secretary of Commerce and put into early operation by the Department of Commerce.

UNITED STATES DEPARTMENT OF COMMERCE

RECOMMENDATIONS FOR REGULATION OF RADIO

ADOPTED BY THE

THIRD NATIONAL RADIO CONFERENCE

CALLED BY

HERBERT HOOVER
SECRETARY OF COMMERCE

OCTOBER 6-10, 1924

WASHINGTON
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RECOMMENDATIONS ADOPTED BY THE THIRD NATIONAL RADIO CONFERENCE

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1. OPENING ADDRESS BY HERBERT HOOVER, SECRETARY OF COMMERCE

This is the opening of the Third Annual National Radio Conference at the Department of Commerce. It is a great pleasure to me to welcome you to this session. You who represent the radio fans, broadcasting stations, engineers, and manufacturers have come at my request to again consider the situation in radio from a national point of view and to determine what steps can be taken to advance the art and improve its service.

Through the cooperation of the broadcasting stations throughout the country, at this opening session we are inviting the listeners of the country to sit in because they are obviously interested in all questions of radio development, and we all wish them to participate in the consideration of our problems.

I have called the conferences of each of the last three years in the confidence that it was only by your cooperation that the requirements of this great service could best be met. There are certain minimum regulatory powers in the Department of Commerce. They are inadequate to meet the shifting situation that this developing art constantly presents. Nor could any legislation keep pace with the changes imposed by scientific discovery and invention now going on in radio. I have been convinced, however, that we could meet these problems by organized cooperation of the industry itself. I need tell no radio listener that this industry is unique in that unless it has stringent rules of conduct to which all elements adhere it will die of its own confusion. We must have traffic rules, or the whole ether will be blocked with chaos, and we must have safeguards that will keep the ether free for full development.

With the development of the art this problem has become one of the most complex technical character ever presented to the Government for solution. At every succeeding conference we have had more and more difficult problems to solve, and those which we present to-day are of a complexity greater than ever before.

It is in a large sense the purpose of this conference to enable listeners, broadcasters, manufacturers, marine, and other services to agree among themselves as to the manner in which radio traffic rules may be determined. Like the two previous occasions, this may be called an experiment in industrial self-government. Through the policies we have established the Government, and therefore the people, have to-day the control of the channels through the ether just as we have control of our channels of navigation; but outside of this fundamental reservation radio activities are largely free. We will maintain them free—free of monopoly, free in program, and free in speech—but we must also maintain them free of malice and unwholesomeness.

Radio has passed from the field of an adventure to that of a public utility. Nor among the utilities is there one whose activities may yet come more closely to the life of each and every one of our citizens, nor which holds out greater possibilities of future influence, nor which is of more potential public concern. Here is an agency that has reached deep into the family life. We can protect the home by preventing the entry of printed matter destructive to its ideals, but we must double-guard the radio.

Radio must now be considered as a great agency of public service, and it is from that viewpoint that I hope the difficult problems coming up before this conference will be discussed and solved.

At the first radio conference I hazarded some modest anticipations as to its development and use. Some thought them visionary, yet we passed every point of these anticipations within 18 months. We have, in fact, established an entirely new communication system, national in scope. In the whole history of scientific discovery there has never been a translation into popular use so rapid as in radiotelephony. So late as the year before I became Secretary of Commerce there were no broadcasting stations. At the end of four years 530 are in operation, making radio available to every home in the country. The sales of radio apparatus have increased from a million dollars a year to a million dollars a day. It is estimated that over 200,000 men are now employed in the industry, and the radio audience probably exceeds 20,000,000 people.

We may well be proud of this wonderful development, but in our self-congratulation let us not forget that the value of this great system does not lie primarily in its extent or even in its efficiency. Its worth depends on the use that is made of it. It is not the ability to transmit but the character of what is transmitted that really counts. Our telephone and telegraph systems are valuable only in so far as the messages sent from them contribute to the business and social intercourse of our people. For the first time in history we have available to us the ability to communicate simultaneously with millions of our fellow men, to furnish entertainment, instruction, widening vision of national problems, and national events. An obligation rests upon us to see that it is devoted to real service and to develop the material that is transmitted into that which is really worth while. For it is only by this that the mission of this latest blessing of science to humanity may be rightfully fulfilled.

BROADCASTING PROGRAMS

The first matter of importance which I desire to lay before you is our broadcasting programs.

When broadcasting first started, the phonograph was a sufficient attraction to the radiotelephone listeners, who were swayed chiefly by curiosity and marvel at the new discovery. Public interest has long since passed this stage. Broadcasting would die in 24 hours if it were limited to transmission of phonograph records. We have made great improvements in material transmitted. Original music, speeches, instruction, religion, political exhortation, all travel regularly by radio to-day. Program directing has become one of the skilled professions. I have, indeed, a great feeling for the troubles of the director in his efforts to find talent and to give to his audience the best that lies at his command. He has done extraordinarily well.

But we require a still further advance in the character of material beyond the capacity of local station directors if the art is to emerge entirely from the curio and entertainment stage to that of fundamental service. Experimental broadcasting upon a national scale by interconnecting stations by wire during the past year has now brought us to the stage where we know it can be done. It has opened a new vision to us. The local material available for the local program is of the highest importance but is not, in my view, enough to maintain the assured interest necessary for the support of the industry nor to fulfill adequately the broadcasting mission.

So far as the art has developed, I think we all agree that for accuracy and regularity of reception we can depend only upon the local broadcasting stations. I know the importance of these smaller stations to the communities they serve. I know that there are millions of crystal sets and small tube sets whose owners are practically compelled to-day to rely upon the stations at their doors and are getting good service from them. These are the people I have in mind and the ones I primarily want to serve, for the owner of the multitube set, reaching out for an indefinite number of miles, is pretty well able to look out for himself. I want to see the little fellow get something more than he has now. My proposition is that the local stations must be able to deliver every important national event with regularity. The local station must be able to bring to its listeners the greatest music and entertainment of the Nation, but far beyond this it must be able to deliver important pronouncements of public men; it must bring instantly to our people a hundred and one matters of national interest. To this it must add its matters of local interest. This can only be accomplished by regularly organized interconnection on a national basis with nationally organized and directed programs for some part of the day in supplement to local material.

It may be stated with assurance that the greatest advance in radio since our last conference is the complete demonstration of the feasibility of interconnection. We owe a debt of gratitude to those who have blazed the way. The pioneers have been the American Telephone & Telegraph Co. in wire interconnection and the Westinghouse Electric & Manufacturing Co. in radio interconnection through the use of short wave lengths. Their experiments have involved technical skill of the highest character which could be found or contributed by few other organizations in the world. Their expenditures, running into the hundreds of thousands of dollars, have been made without direct consequential return. It has been possible to broadcast many national events over three-quarters of the United States during the past year, and the whole country has been covered twice. The service deserves the appreciation of the public. for it has demonstrated this great thing to be practicable.

It is our duty to consider the possibilities and potentialities of interconnection as a regular daily routine of the nation. Unless it be systematically organized we can not expect its continuation. I realize that this matter, except in so far as it may be fostered and encouraged, does not lie in the Government. It would be unfortunate, indeed, if such an important function as the distribution of information should ever fall into the hands of the Government. It would be still more unfortunate if its control should come under the arbitrary power of any person or group of persons. It is inconceivable that such a situation could be allowed to exist; but I am not now dealing with monopoly. Nor is this a question where anyone lays claim to a monopoly. Interconnection is going on to local extent and over the wires of the telegraph companies, the telephone companies, and by radio itself. We have promises of interconnection of wired wireless. If there are several methods, it means that we might have several alternative programs always available. But whatever the method of interconnection may be we are lacking in a definite organization of a national system of programs and a basis of support.

I believe that the quickest way to kill broadcasting would be to use it for direct advertising. The reader of the newspaper has an option whether he will read an ad or not, but if a speech by the President is to be used as the meat in a sandwich of two patent medicine advertisements there will be no radio left. To what extent it may be employed for what we now call indirect advertising I do not know, and only experience with the reactions of the listeners can tell. The listeners will finally decide in any event. Nor do I believe there is any practical method of payment from the listeners.

This brings me to a definite proposition that I believe is of first importance to every radio listener. I suggest for your consideration the possibility of mutual organization by broadcasters of a service for themselves similar to that which the newspapers have for their use in the press associations, which would furnish programs of national events. It would arrange for their transmission and distribution on some sort of a financial basis just as the press associations gather and distribute news among their members. We would thus have the positive assurance to every household of what is now but an experiment; that is, every home could participate in every national event.

THE PROBLEM OF INTERFERENCE

One of the most important subjects for your consideration is the rearrangement of our system so as to provide more operating channels for broadcasting stations—more wave lengths. This is the first step to eliminate more of the interference. As you know, our previous conferences have classified our broadcasting stations, have zoned the country in effort to secure these results. The wave lengths of the stations in the same zone were placed at least 50 kilocycles apart, adjoining zones at least 20 kilocycles apart, and distant zones at least 10 kilocycles apart. This was a great step and has been in a large degree successful, but many new difficulties have arisen. Of the present 530 stations 57 are class B, with a power of from 500 to 1,000 watts and having a wide range, and 387 are class A, many using small power and covering small areas. There are still 86 class C stations, most of which have low power, all on a wave length of 360 meters. Our chief trouble is with the class B situation. They are all assigned within the band of 288 to 545 meters, within which there are, under the present system of allocation and excluding the class C band, only 44 available wave bands and only 33 that seem desirable at present. To assign these among the 57 stations necessarily means duplication, although it was the theory of the last conference that individual wave lengths could be assigned to each. As it now develops, only 23 stations either have exclusive wave lengths or are sharing with stations so distant that both may operate simultaneously, while the remaining 34 are compelled to divide time, and the congestion is growing in the large cities, New York and Chicago particularly. A recent survey made by the supervisors of radio of the various districts shows that 21 new class B stations are now under construction and that 25 others are contemplated, so that the question of allocation is one of increasing difficulty. In the light of scientific and technical development in both transmitting apparatus and receiving sets during the year I believe that some changes in zoning or in station separation may now be installed, thus creating additional wave lengths for assignment. It has been suggested, also, that the band now reserved for class B might be somewhat broadened. Removals of class C stations from the class B band and their distribution into individual wave lengths would likewise give some relief, depending on what proportion of the present class C stations qualify for class B licenses. Another constant source of interference are the radio code signals which lie in the broadcasting band. This is the result of the old international agreements before radio broadcasting was discovered. I shall refer to them later.

POWER OF BROADCASTING STATIONS

Another question of importance is the limit of power to be used in broadcasting. Most class B stations are now operating on 500 watts. A limitation of 1,000 watts is imposed in the license. I understand that there are several stations erected or in course of construction which contemplate the use of power up to 5,000 watts, and I am aware of the suggestions of those who would go beyond even this to so-called "superpower" of 50,000 watts. There is opposition, especially to the latter. Its advocates tell us of the great advantages in the way of louder signals and more distant transmission, while opponents complain of interference and the drowning out of other stations. The latter fear is particularly acute if such a powerful station be located in a congested receiving center. From the viewpoint of nation-wide broadcasting, the question becomes one as to whether we should aim to cover a large territory through a single powerful station or through a number of interconnected smaller ones. We must not stifle progress, but there are vital reasons why we must not do anything that will interfere with the programs of local stations on which so many of our people depend, nor with the wide selective range in programs which they now have. It may be that both purposes may be accomplished without loss to either. I recommend the subject for your most careful consideration and hope that you may be able to reach a satisfactory conclusion.

I can assure you that this is a question of considerable popular interest. During the past 10 days I have received thousands of letters from men, women, and children all over the country protesting against what they honestly believe would result in depriving them of the chance to listen to the local stations or to use their will in selecting the ones they want to hear. They fear a monopoly of the air. I have written to many of them and intend to write to all. I have said in my letters, and if there are any of them listening to-night I say again, that the air is free to-day, and free it will remain. There is no man nor body of men strong enough to monopolize it even if there was any desire to do so. And always bear in mind that permission to use the air is reserved to the Government. There is, however, much misunderstanding in the loose use of "higher power" or "superpower." There are two very different things involved. The discoveries of the past year show that static can be overcome by somewhat higher power than the 1,000-watt limit at present. It is desirable that all stations should increase in power for this reason. The "superpower" is an entirely different thing. We know very little about it, and it has many implications of interference with local stations and of monopoly which must cause us all a serious thought. On the other hand, a moderate increase in power to the present stations is founded upon the basis of better service by local stations. This is particularly needed by our farmers and others with smaller sets who are now entirely cut off by static in the daytime and summer time.

GENERAL TENDENCIES IN DEVELOPMENT OF BROADCASTING

There seems at present some tendency toward a decrease in the total number of broadcasting stations. September 1, 1923, there were 563 licensed stations. On the same date this year the number had fallen to 533, a loss of 30. This decrease, however, has occurred entirely among the smaller stations in classes A and C. The more important stations, those of class B, have substantially increased, the number then having been 44 as against 56 at present, with 46 others either under construction or proposed. As to whether this shows a real trend toward an abandonment of the smaller stations, with a corresponding additional reliance upon the larger ones, even though more distant, it is too early to determine.

The broadcasting service of the country, taken as a whole, must be costing $10,000,000 a year, and there is no substantial income. It is therefore of some interest to classify and study the ownership of the stations; to known the probable motives that impel their owners to expend the large sums of money which are necessary for their construction and operation and for which there is usually no direct return. So far as is known to the department, of the present stations 196, or over one-third, are owned and operated by manufacturers of or dealers in radio apparatus, whose interest is, of course, apparent. Department stores and similar mercantile concerns add 39 to this number and publishers 41, making a grand total of 276 known stations, of which 44 are class B, which may be said to have a direct interest in the publicity legitimately resulting from their own broadcasting. On the other side we have 85 educational institutions, 35 churches, 12 city and State agencies, 12 clubs, of which 7 are class B (4 schools, 2 State or city agencies, and 1 church), all of which may be said to operate from more altruistic motives.

MARINE SERVICE

Those who are engaged in the use of radio for marine services between ship and shore and ship and ship feel that the present band of wave lengths devoted to their use is too narrow. We must not forget that what is a convenience or a pleasure for us is a necessity for them, and that life may depend on the efficiency of their communication service. There is undoubtedly congestion along our coasts, particularly in the vicinity of such harbors as New York, Boston, and San Francisco. There are two fundamental troubles in the situation, and they are interdependent: First, the character of the apparatus used, and, second, the fact that most ships operate on only two wave lengths, 600 and 706 meters. Practically all marine radio equipment is of the spark type. There can be no economical use of wave lengths until these conditions are improved.

The London convention of 1912 contemplated that ship communication should be conducted either on 300 or 600 meters, an alternative of 1,800 meters being allowed under certain conditions; also marine communications grew up on 450 meters. However advisable it may then have been to have all ships on two or three wave lengths, it is certainly not practicable now. We have here an example, and it is not the only one, of the folly of putting a straight-jacket on such a rapidly growing art.

The situation among ships to-day is much the same as existed in broadcasting at the time of the last conference, when all stations were trying to operate on 360 or 400 meters. The outstanding achievement of that conference was the adoption of the idea of giving to each station, so far as possible, an individual wave length. If our ships had a class of equipment which would allow it, I am not at all sure that a similar plan could not be worked out for them with separate wave lengths assigned to separate groups or classes of vessels. I fully realize that this can not be done at once. I know the financial and other difficulties that stand in the way of better apparatus. I believe, nevertheless, that some way should be found to encourage improvement and likewise to make the better equipment freely and reasonably available. Meanwhile some consideration should be given to a method of temporary relief. The question is one of relation. If there are not enough channels to provide all that both the marine interests and the broadcasters may legitimately desire, there must be an accommodation between them, giving to each as much as possible with due regard to the other. Possibly additional wave lengths above 600 meters may be assigned for marine use. Moreover, we must strive to get the marine signals of 300 and 450 meters out of the public broadcasting band so as not to interfere with broadcasting. I commend the subject to your careful attention.

OUTSIDE SOURCES OF INTERFERENCE

I have not attempted to list all the subjects that may come before you, but have merely referred to a few which seem most troublesome from the administrative side. One matter that must be dealt with sometime, but over which there is no means of control at present, is the interference from nonradio sources. We listeners have all experienced frequently and to our great disgust the squeals and roars which we are told come from electrical devices of various sorts in which there is no purpose to cause audible disturbance. The department has received a vast number of complaints based upon trespassing noises of this character. It is hard to trace them to their source and difficult to deal with them when found. Some branch of our radio industry certainly should investigate and study them. Harmonics, too, are troublesome. It is useless to assign a station to a definite wave length if its signals go out not only on that one but on three or four others. Our amateurs, who make up by far the largest element in the radio family outside of the listeners as a whole, are particular sufferers, since the harmonics from many stations have an especial tendency to invade the amateur band. Accurate and sharp transmission must be insisted upon.

AMATEURS

Nor have we overlooked in these previous conferences the voice or interest of the amateur, embracing as he does that most beloved party in the United States—the American boy. He is represented at this conference, and we must have a peculiar affection for his rights and interests. I know nothing that has contributed more to sane joy and definite instruction than has radio. Through it the American boy to-day knows more about electricity and its usefulness than all of the grown-ups of the last generation. I have during the past year somewhat extended this wave band. I hope that this conference may dismiss the objections that have been raised to this action.

COOPERATION OF THE DEPARTMENT

The officials of the Bureau of Navigation, which has direct charge of administrative features and full familiarity with the entire situation, are ready to give you the benefit of their information and advice.

The Bureau of Standards has prepared a report on many of the technical phases which will come before you, and its personnel and facilities are at your disposal. The interdepartment radio committee has done preparatory work, and its members will, I am sure, be glad to cooperate with you in the consideration of all matters which have a governmental bearing. The supervisors of radio from all districts of the country are in attendance, with first-hand information as to conditions, and their knowledge, based on actual experience in the field. In short, the Department of Commerce is at your command. I believe that your membership includes every angle of radio interest. I look forward to your conclusions as a great step in the development and progress of the industry.

CONCLUSIONS

In conclusion, I can only repeat what I have said on these occasions before—that it is our duty as public officials, it is our duty as men engaged in the industry, and it is our duty as a great listening public to assure the future conduct of this industry with the single view to public interest. The voluntary imposition of its own rules and a high sense of service will go far to make further legislation or administrative intervention unnecessary. Indeed, it will contribute enormously to the development of the art if in this stage of its infancy we can annually secure such adjustments by voluntary action as will protect public interest. We shall then have evolved a unique chapter in the development of public utilities.

The two past conferences have been successful in these purposes, and with only slight modifications made necessary by changing conditions the department has been able to follow their recommendations in the performance of its duties, and the industry has supported and conformed to these recommendations cheerfully and uncomplainingly although at some self-sacrifice. It is my ideal and yours that this new great implement which science has placed at the disposal of our people shall be developed and expanded in such fashion as to bring the maximum good, and that we may avoid any complaint from our successors that on one hand we sacrifice public interest or on the other we in any way dim that fine sense of initiative and enterprise in our people that is fundamental to all advancement in our Nation.

I congratulate the conference on the spirit shown in the past, and I know you will enter upon your new deliberations in the same attitude.

2. ORGANIZATION OF THE CONFERENCE

HERBERT HOOVER, Secretary of Commerce, chairman
LAURENS E. WHITTEMORE, general secretary

SUBCOMMITTEE NO. 1: GENERAL ALLOCATION OF FREQUENCY OR WAVE-LENGTH BANDS

W. D. Terrell, chairman.
J. F. Dillon, secretary.
Maj. L. B. Bender.
C. B. Cooper.
George S. Davis.
Dr. J. H. Dellinger.
Lloyd Espenschied.
Leo Fitzpatrick.
Dr. A. N. Goldsmith.
A. H. Halloran.
Prof. L. A. Hazeltine.
J. V. L. Hogan.
Prof. A. E. Kennelly.
F. A. Kolster.
L. L. Lee.
W. G. Logue.
E. F. McDonald, jr.
Capt. Ridley McLean.
H. P. Maxim.

SUBCOMMITTEE NO. 2: ALLOCATION OF FREQUENCY OR WAVE-LENGTH BANDS TO BROADCASTING STATIONS

Dr. George K. Burgess, chairman.
S. W. Edwards, secretary.
R. Asserson.
Edgar L. Bill.
H. E. Campbell.
John Campbell.
A. H. Dyson.
W. E. Downey.
Dr. A. N. Goldsmith.
L. B. Henson.
J. V. L. Hogan.
C. W. Horn.
Lambdin Kay.
S. M. Kintner.
Jos. Knowland.
Elam Miller.
Adam Stein.
W. A. Wheeler.

SUBCOMMITTEE NO. 3: GENERAL PROBLEMS OF RADIO BROADCASTING

Gen. George O. Squier, chairman.
E. A. Beane, secretary.
Earle C. Anthony.
E. H. Armstrong.
R. G. Callvert.
L. M. Clausing.
James Cleary.
Powel Crosley, jr.
A. E. Davies.
C. E. Erbstein.
Herbert Frost.
W. E. Harkness.
Prof. C. M. Jansky, jr.
A. Atwater Kent.
H. R. Kibler.
Paul B. Klugh.
Arthur H. Lynch.
F. H. McDonald.
E. B. Mallory.
David Sarnoff.
John Shepard, 3d.
W. A. Strong.
G. D. Wardrop.
W. A. Wheeler.

SUBCOMMITTEE NO. 4: PROBLEMS OF MARINE COMMUNICATION

Wallace H. White, jr., chairman.
Arthur Batcheller, first secretary.
C. C. Kolster, second secretary.
E. B. Calvert.
C. B. Cooper.
George S. Davis.
Lloyd Espenschied.
F A. Kolster.
L. L. Lee.
W. G. Logue.
Capt. Ridley McLean.
J. L. Preston.
E. J. Simon.
A. J. Steelman.
T. M. Stevens.
Lieut. E. M. Webster.

SUBCOMMITTEE NO. 5: AMATEUR PROBLEMS

H. P. Maxim, chairman.
R. Y. Cadmus, secretary.
E. H. Armstrong.
Zeh Bouck.
Prof. C. M. Jansky, jr.
Dr. C. B. Jolliffe.
Jos. H. Montgomery.
P. C. Oscanyan, jr.
C. H. Stewart.
K. B. Warner.

SUBCOMMITTEE NO. 6: INTERFERENCE PROBLEMS

Maj. L. B. Bender, chairman.
T. G. Deiler, secretary.
A. M. Caddell.
W. J. Canada.
Dr. J. H. Dellinger.
Prof. L. A. Hazeltine.
J. V. L. Hogan.
S. M. Kintner.
F. A. Kolster.
Elam Miller.
H. C. Moore.
O. C. Roos.
W. D. Terrell.

SUBCOMMITTEE NO. 7: INTERCONNECTION

Judge S. B. Davis, chairman.
O. R. Redfern, secretary.
L. Ainsworth.
E. C. Anthony.
S. E. Baldwin.
James Cleary.
Alfred H. Dyson.
Frank W. Elliot.
Geo. C. Furness.
Jos. S. Gettler.
R. B. Hale.
W. E. Harkness.
Lambdin Kay.
C. W. Horn.
D. S. Knowlton.
E. B. Mallory.
H. E. Metcalf.
David Sarnoff
Adam Stein.
W. A. Strong.

SUBCOMMITTEE NO. 8: COORDINATING COMMITTEE

Herbert Hoover, chairman.
W. Van Nostrand, jr., secretary.
Earl C. Anthony.
E. H. Armstrong.
Maj. L. B. Bender.
Dr. George K. Burgess.
George S. Davis.
S. B. Davis.
Dr. J. H. Dellinger.
S. W. Edwards.
W. E. Harkness.
Prof. L. A. Hazeltine.
J. V. L. Hogan.
Prof. C. M. Jansky, jr.
Prof. A. E. Kennelly.
Joseph Knowland.
F. A. Kolster.
Capt. Ridley McLean.
E. B. Mallory.
Hiram Percy Maxim.
Elam Miller.
John Shepard, 3d.
Gen. Geo. O. Squier.
C. H. Stewart.
W. D. Terrell.
K. B. Warner.
Wallace H. White, jr.

3. FINAL RECOMMENDATIONS

To the Hon. HERBERT HOOVER,
Secretary of Commerce, Washington, D. C.

The Third National Radio Conference respectfully submits its report to you upon its deliberations:

The conference convened at Washington on October 6 and has been in continuous session until to-day (October 10). The work was divided among subcommittees upon important subjects, and the recommendations of these subcommittees have been coordinated into a whole, and they are submitted herewith as the unanimous report of the conference.

The conference has kept constantly before it the thought that its only purpose is to devise ways for the betterment of all phases of radio and the elimination of all possible impediments to its full realization of public service. The art is one of continuous flux due to the rapidity of progress through scientific discovery and invention. It requires constant revision in the relationships between its different members and in the relationships of the Government in its regulation. We have given consideration to the progress of development and to the needs of the service.

For better understanding of the reports upon special subjects, which are necessarily of a highly technical character, the following summary of the outstanding recommendations is given:

PUBLIC BROADCASTING

The great problem in broadcasting is that of interference. It may arise in several ways, either by direct interference of one station by another, because of too close proximity of frequency, interference by radiotelegraph signals, or interference from outside electrical sources.

In dealing with the first of these causes the conference has been successful in providing additional channels so that stations may not conflict with one another. To accomplish this, the present broadcasting band has been extended so as to include all frequencies from 550 to 1,500 kilocycles (wave lengths from 545 to 200 meters). Furthermore, a new system of zoning has been worked out by which it is possible to obtain still additional channels. The net result will be that instead of a number of frequencies now used by general broadcasting stations there will be an increase of 30 possible channels, bringing the total up to 100.

In order to do away with the interference with broadcasting by radiotelegraphic code signals used chiefly in marine communication, the conference recommends that 1,000 kilocycles (300 meters) which falls within the above band be discontinued for marine use, this frequency being left exclusively for broadcasting; 667 kilocycles (450 meters), which up to a short time ago was likewise used for marine communication, has already been discontinued. The conference recommends that 500 kilocycles (600 meters), which is close to the upper end of the broadcasting band, be limited to distress signals and used as a calling wave, which means that general marine communications will not be carried on at this frequency. This effectually clears the broadcasting band of code signals.

As to interference from outside electrical sources, the conference took affirmative action in recommending that there be general coöperation with the producers and users of electrical energy by which this interference is now caused. The conference is glad to be able to say with very few exceptions there has been manifested the greatest desire on the part of such interests to minimize this interference.

DESIGNATION AND ALLOCATION OF STATIONS

The conference recommends a new classification for stations. Present class B stations are hereafter to be known as class 1; class A stations as either class 2 or 3; and class C stations to go either into class 1, 2, or 3, according to their character.

The conference recommends that the class C stations still remaining on a frequency of 833 kilocycles (360 meters) be assigned new frequencies (wave lengths). This, of course, does not mean the abolition of class C stations, but merely that instead of all of them operating on one wave length, as at present, and interfering with each other they shall have separate assignments and be distributed through the broadcasting band.

The details as to the allocation of frequencies or wave lengths to the particular stations under the new zoning system are being worked out by a continuing committee in cooperation with the radio supervisors of the various districts. The report will be completed within a few days.

The marine communication interests willingly accepted the recommendation of the department for the abandonment of their use of 667 kilocycles (450 meters). Their representatives at this conference should receive our thanks for the fine spirit of cooperation they have shown in further removing their operations from the broadcasting band.

MARINE RADIO SERVICE

While providing additional channels for broadcasting, the conference has been able likewise to provide additional channels for marine use. This has been done by specifically designating for ship communication the frequencies of 343, 410, 425, 454 kilocycles (wave lengths 834, 731, 706, 660 meters) with 500 kilocycles (600 meters) as a calling and distress wave. This provides five channels instead of the two now in use and means a vast improvement in the present congestion near our coasts, while at the same time the interference with broadcasting will be, it is hoped, largely eliminated.

The questions of reports giving the positions of ships was considered by the marine communication committee. It declined to recommend the prohibition of free "TR" reports, but indicated its approval of the voluntary efforts to reduce the number of unnecessary reports. The action was taken in the hope that it would eliminate interference much complained of by broadcasting stations.

AMATEURS

The conference has allocated to amateurs substantially the same frequency bands that are now in use, with some minor changes in their location. The temporary allocation of frequencies above 2,000 kilocycles (below 150 meters) made by the department to the amateurs some months ago is given definite approval with some slight changes in the bands. The net result of this is to give to amateurs an increase over what they had at the end of the conference a year ago and to allow them a much greater area for operation.

CENSORSHIP

The conference thoroughly discussed all angles of program directing and heard a great many arguments on this important subject. As a result it recommends that the policy of the department of noninterference in programs sent out by broadcasting stations should be upheld. Any other attitude would necessarily involve censorship in some degree.

INTERCONNECTION

The interconnection of stations so as to provide for simultaneous broadcasting has been the most important development of the last 18 months. It has now made possible a wide extension in knowledge of national events. It means a vast improvement in program. It makes the talent of our great cities available everywhere. It has reached the point where a few stations are now thus interconnected as a matter of routine and regular procedure. There have been very recently several actual demonstrations of the possibility of nation-wide simultaneous broadcasting by interconnection. The conference affimatively finds that simultaneous broadcasting of national events is to-day practicable over a large portion of the United States. It believes that nation-wide broadcasting by interconnection of stations deserves every encouragement and stimulation, and to that end recommends the appointment by the Secretary of Commerce of a continuing committee which will give consideration to the working out of the necessary plans for its full accomplishment.

HIGHER POWER FOR BROADCAST STATIONS

Some confusion has arisen from the general use of the term "higher power," while, as a matter of fact, there is a sharp distinction in its significance in two entirely different fields—one the increase in power in all stations and the other the so-called "superbroadcasting" stations.

The conference has been impressed with the necessity of placing broadcasting upon such a basis that it may be of continued service at all times of the year and all times of the day, its signals reaching with proper intensity and clarity all classes of people. We must have at all times a special thought for the owners of small sets and for those whose homes are far from great centers of population. The true mission of broadcasting will not be realized until its service is available to each one of them at all times, as it is now available in our larger cities. It has been conclusively demonstrated by experimental work during the past year that only by the use of higher power can static and other kinds of interference be overcome, and that some general increase over the 1,000-watt limitation now imposed is therefore very desirable. This is especially true as to transmission during the summer and day time. Many listeners have crystal sets, and many located in the agricultural regions, who are largely dependent upon radio for their immediate contact with the markets, weather reports, and news, are not now able to receive such signals continuously. In order that they may have a continual and dependable service, an increase of power should be allowed to the stations upon which they are dependent, with due regard to distance and interference with other stations.

This, however, presents entirely different considerations from those involved in the so-called "superpower" stations which contemplate the use of power up to 50,000 watts. The conference has been strongly urged to recommend the abolition of all limitation on power, but it refuses to do so. There has been no experience in this country and little anywhere else in the world with broadcasting by stations of such power. In the absence of actual knowledge of their effect or usefulness, the conference refuses to recommend any authorization of the general issue of licenses for stations of this character. The conference does recommend that experimentation should be allowed but that this experimentation be carried on under strict limitation, so that it be without interference with the service of any other stations or with the reception now enjoyed by listeners. Only after such experiments have been made will it be possible to determine whether such broadcasting will interfere with the existing system or whether it will be in the public interest. The conference is unalterably opposed to any monopoly in broadcasting.

FURTHER APPROPRIATIONS FOR THE DEPARTMENT

The funds appropriated for the enforcement of the radio law by the department have become wholly insufficient. The inspection districts are so large and radio activities within them have multiplied so rapidly that it is a physical impossibility for the inspectors to cover their districts in the most efficient manner. Complaints come to them from all parts of the district which require their personal attention. We strongly recommend to Congress an increase in the appropriations made for the enforcement of the radio laws by the Department of Commerce.

DETAILED REPORTS

The detailed reports upon special subjects are submitted herewith.

4. REPORTS OF SUBCOMMITTEES

SUBCOMMITTEE NO. 1: GENERAL ALLOCATION OF FREQUENCY OR WAVE LENGTH BANDS

The committee recommends the allocation of the frequency bands for the various radio services as indicated in the following table.

In submitting this recommendation the committee appreciates that the allocations as recommended must be considered to some extent temporary or experimental on account of the absence of an international agreement relative to frequencies above 2,000 kilocycles (wave lengths below 150 meters).

Frequency or wave band allocations

Kilocycles	Meters	Service
95–120	3,156–2,499	Government, CW and ICW, exclusive.
120–157	2,499–1,910	Marine, CW and ICW, exclusive.
157–165	1,910–1,817	Point-to-point, CW and ICW. Marine, CW and ICW
165–190	1,817–1,578	Point-to-point, CW, ICW, spark. Marine, CW and ICW.
190–230	1,578–1,304	Government, CW and ICW, exclusive.
230–235	1,304–1,276	University, college, and experimental, CW and ICW, exclusive.
235–250	1,276–1,199	Marine, phone, nonexclusive.
250	1,199	Government, CW, ICW, nonexclusive.
250–275	1,199–1,090	Marine, phone, nonexclusive.
275	1,090	Government, CW, ICW, nonexclusive.
275–285	1,090–1,052	Marine, phone, nonexclusive.
285–500	1,052–600	Marine and coastal, including radio compass and radio beacons.
500–550	600–545	Aircraft, CW, ICW, phone and fixed safety-of-life stations, phone, exclusive.
550–1,500	545–200	Broadcasting services, phone, exclusive.
1,500–2,000	200–150	Amateur, CW, ICW, phone.
2,000–2,250	150–133	Point-to-point, nonexclusive.
2,250–2,500	133–120	Aircraft, exclusive.
2,500–2,750	120–109	Mobile.
2,750–2,850	109–105	Relay broadcasting, exclusive.
2,850–3,500	105–85.7	Public service.
3,500–4,000	85.7–75.0	Amateur and Army mobile.
4,000–4,500	75.0–66.6	Public service and mobile.
4,500–5,000	66.6–60.0	Relay broadcasting, exclusive.
5,000–5,500	60.0–54.5	Public service.
5,500–5,700	54.5–52.6	Relay broadcasting, exclusive.
5,700–7,000	52.6–42.8	Public service.
7,000–8,000	42.8–37.5	Amateur and Army mobile.
8,000–9,000	37.5–33.3	Public service and mobile.
9,000–10,000	33.3–30.0	Relay broadcasting, exclusive.
10,000–11,000	30.0–27.3	Public service.
11,000–11,400	27.3–26.3	Relay broadcasting, exclusive.
11,400–14,000	26.3–21.4	Public service.
14,000–16,000	21.4–18.7	Amateur.
16,000–18,000	18.7–16.7	Public service and mobile.
18,000–56,000	16.7–5.35	Beam transmission.
56,000–64,000	5.35–4.69	Amateur.
64,000–infinity	4.69–0	Beam transmission.

In the above connection the committee unanimously recommends that the Department of Commerce no longer require ship or shore stations to be equipped to send or receive on a frequency of 1,000 kilocycles (wave length of 300 meters).

Except for the bands designated as nonexclusive, Government stations shall use only the bands designated by the Third National Radio Conference as "Government" for strictly Government business, and only the bands not so designated for public service; that is, commercial or non-Government business. It is recognized that there will have to be occasional exceptions to this rule in the course of operation of particular stations. Thus, Government stations in Alaska which handle almost exclusively non-Government commercial business will not be expected to shift to Government frequencies when occasional strictly Government messages are handled.

Another exception to the foregoing principles is also allowed in connection with Government mobile radio equipment for training purposes. It may be used to a limited extent and subject to the following restrictions, outside the bands reserved for the exclusive use of the Government. For such training and operation uses on frequencies between 500 and 1,000 kilocycles (wave lengths between 600 and 300 meters) they will be used in the following manner: The officer in charge of military or naval radio operations will confer with the Department of Commerce supervisor of radio in the locality where interference is probable to determine the frequencies which may be used with least interference. Naval and military operations will then be confined, so far as possible, to the time periods, frequencies, and power which will cause minimum interference in the locality. It is understood that military and naval operation in this band will in general be limited to an antenna radiation of 75 meter-amperes, to daylight hours, and to a limited number of hours per week and weeks per year. This frequency will differ somewhat in different parts of the country.

It is understood by the committee that the departments of the Government are authorized to utilize the frequencies above 2,000 kilocycles (waves below 150 meters), with due regard to the authorized use thereof by other services as determined by reference to the Department of Commerce.

It is further understood with reference to the use of frequencies above 2,000 kilocycles (wave lengths below 150 meters) that the allocation thereof to a Government department for service analogous to any of the above shall be in all respects identical with other assignments.

SUBCOMMITTEE NO. 2: ALLOCATION OF FREQUENCIES OR WAVE LENGTHS TO BROADCASTING STATIONS

The present general organization of broadcasting stations is considered satisfactory. A number of changes of detail are included in the following recommendations with a view to making fuller use of the frequencies available for broadcast service. These recommendations assume a frequency range for broadcasting from 550 to 1,500 kilocycles (545 to 200 meters). Without making radical changes, the recommendations group stations somewhat in the order of the effect they produce on the radio audience. The present class B group is assigned to substantially the same frequency band as at present, but the availability of the frequencies in this band is materially increased, mainly through the proposed elimination of the class C. By a modified zoning plan, which experience has shown to be desirable, improved conditions in the matter of interference should result. The stations which will go into class 2 (a part of the present class A), which render a high class of program, though not in general up to the standard of the first class, are to be benefited by the recommendations, since the number of stations in this class is very materially reduced by the removal to a third class of the strictly local stations of very small power. A frequency assignment which is believed to be sound is proposed for the three classes.

For reasons which will appear more fully in the following it is recommended that the names of the classes of stations be changed from the letter designations, class B, class A, etc., to the number designations, class 1, class 2, and class 3. Class 1 will correspond to the present class B. This nomenclature will have the advantage that the stations of highest power and, generally speaking, highest quality transmissions will be given the natural designation of class 1.

No change is proposed in regard to the "broadcast development" class of stations. There are at present only two such stations; they are considered as experimental, and there seems to be no good reason to change their requirements or to attempt to fit them more closely into the general scheme of broadcasting stations than at present.

It is recommended that the Department of Commerce set a time (November 15 tentatively suggested) after which no licenses of the present class C (833 kilocycles, 360 meters) will be renewed. This will make possible a very material gain in the number of channels available for class 1. Only one frequency between 790 and 870 kilocycles (380 and 345 meters) is at present assigned. Furthermore, no frequencies above 970 kilocycles (309 meters), except one assigned a few days ago, are now assigned to class B stations. In view of the contemplated further elimination of ship transmissions on 1,000 kilocycles (300 meters), it will be possible to assign class B frequencies up to a considerably higher limit.

It is recommended that broadcasting stations be divided into three classes, as follows:

Class	Kilocycles	Meters	Number of channels
1	550–1, 070	(545–280)	53 plus 10.
2	1, 090–1, 400	(275–214)	32.
3	1, 420–1, 460	(211–205)	5.

It should be noted that this involves little change from the assignment recommended last year for class 1 (old class B). The upper limit for class 1 is here made 1,070 as compared with 1,040 for the old class B stations. While there is thus an extension of only 30 kilocycles to this band, it will in the future be possible to use the whole band, and a very great increase in the number of channels in the band thus becomes available. The reasons why such an increase is desirable will be more fully set forth below. There are, for the reasons earlier mentioned, only 37 channels (bands 10 kilocycles wide) in class 1 (old class B) now actually used. The above recommendation provides 53 satisfactory channels. It is also recommended below that the frequencies used in the present zone 1 on the eastern coast of the United States be duplicated in zone 6 on the western coast, thus giving 10 channels which are in effect distinct additional channels.

The above recommended frequency limits involve practically no change in the number of channels available for class 2 stations (old class A), there being 32 channels as against 31 channels heretofore.

It is recommended that all broadcasting stations which use less than 100 watts power be assigned frequencies in class 3. This provision should result in great improvement in the service rendered by class 2 (old class A) stations, since they will be relatively free from local interference produced by the stations of very small power which, on the average, furnish a grade of program which is of only local and limited interest.

It is recommended that manufacturers and organs of publicity make a concerted effort to make the higher frequencies of class 2 and those of class 3 actually available to the public through encouragement of the design and use of receiving sets which include this range. It is possible by the use of various expedients to reach these frequencies with most of the receiving sets in use. It would, in addition, be highly desirable that manufacturers so design receiving sets that the higher frequencies will be less crowded together on the dials.

Returning to the question of the class 1 stations, the considerable number of additional channels have been provided in view of three considerations: (*a*) Provision should be made for the operation without interference of stations of corresponding qualifications in this same frequency band in Canada, Cuba, and Mexico; (*b*) a large number of additional class 1 stations are now under construction and proposed; (*c*) some extension of this band is possible through the extension of the whole broadcast band from its former upper limit of 1,350 kilocycles (222 meters) to 1,500 kilocycles (200 meters).

It is recommended that in a given locality not more than two class 1 stations be licensed on a given frequency. This will require that no station be required to divide more than half the time. Any additional applicants should be temporarily assigned to frequencies in the class 2 band until a vacancy is available. There is no question as to the authority of the Department of Commerce to select the frequency upon which a station should operate. Since in the plan proposed there are 63 class 1 channels, there would thus be a maximum possible of 126 class 1 stations.

It is recommended that a revised zoning plan be adopted. The zoning scheme adopted last year was sound in principle, and the plan herewith proposed is simply a modification such as the actual development of broadcasting stations has shown to be desirable. It contemplates the establishment of a sixth zone on the west coast which shall use identically the frequencies used in zone 1. Such duplication of frequencies has been in part put into practice by the Department of Commerce, and experience has shown that because of the distance and the difference in time the plan is entirely practicable and should be extended to the whole sixth zone. This plan will have particular advantage for the west coast because if there should be in the future greater congestion of stations it would be possible to utilize in addition some of the zone 2 frequencies. The other zones can not benefit in this manner. The plan retains all of the principles of the present class B assignments; that is, the 50-kilocycle separations in each zone and the minimum of 20 kilocycles separation between stations in adjacent zones. The only change made in respect to the existing assignment of station frequencies is the drawing of the zone lines in such a way as to more nearly equalize the distribution of frequencies to the several zones.

It is believed that there is no way to provide for more class 1 station frequencies or for a better distribution of them so as to lessen interference other than the provision of additional channels and the modification of the zoning arrangements along lines such as are proposed herein. Both of these recommendations will require some changes in the frequencies of class 1 broadcasting stations. Such changes are inevitable, but the reassignment should be made with a view to minimizing the changes required for all stations. It is recommended that a small continuing committee be designated by the conference to remain in Washington and collaborate with the radio supervisors in a reassignment of the broadcasting station frequencies in accordance with the foregoing principles.

On the question of frequencies to be used by broadcasting stations to be licensed to operate on higher power than now prescribed, the following recommendations are made:

In licensing stations on higher power than now permitted it is recommended that the Department of Commerce utilize in zones 2, 3, 4, and 5 any of the frequencies assigned to the class 1 stations.

Assignments of class 1 frequencies or wave lengths to stations granted an experimental license to operate on higher power than now prescribed, located in zone 1, to be made only for five frequencies 100 kilocycles apart; that assignments of class 1 frequencies or wave lengths to stations granted an experimental license to operate on higher power than now prescribed, located in zone 6, be made only on five frequencies or wave lengths 100 kilocycles apart; and that the two series of five frequencies or wave lengths each in zones 1 and 6 be staggered.

SUBCOMMITTEE NO. 3: GENERAL PROBLEMS OF RADIOBROADCASTING

After three extended sessions of your subcommittee No. 3 in regard to the general problem of radiobroadcasting due consideration has been given to the class of programs which are to be broadcasted from various stations. After an extended discussion on the details of making recommendations to the conference it has been deemed advisable that the Department of Commerce, as in the past, take no steps to regulate the material broadcast from any station in the country, as it is believed that each station desires to cover a certain field and to entertain or educate a certain class of people. To regulate the programs under these conditions would mean censorship, therefore official censorship is not recommended.

In regard to the changing of the requirements for operators' licenses, it has been recommended by the committee that the present experiment and instruction grade of license be made more elastic.

It has been deemed advisable that the operators employed at broadcasting stations throughout the country should not be required to secure the same class of license as that required for marine communication. The present so-called marine license provides that the holder have a thorough knowledge of all modern systems of radio communication, and as radio broadcasting and the apparatus pertaining thereto is a science within a science, this committee recommends that a new class of operators' licenses be created, different from the license required of other types of service, and the examination for this license be based upon the needs of the entire radio broadcasting service.

The question of so-called "superpower" or increased power for broadcasting stations has been considered in detail, and this committee has decided: "To determine the advisability of permitting the expansion of broadcasting by the employment of increased power beyond that prescribed in the regulations for class B stations and to permit the use of apparatus for this purpose to any applicant and to remove certain limitations now prescribed for class D stations, and for the purpose of observing what interference, if any, might result in public broadcast reception in the various localities this committee recommends that a new class of license be established, and that licenses in this class shall be granted by the Secretary of Commerce, who shall have discretionary power to prescribe the type of apparatus, location, frequency, power, and requirements of operation of such stations, and that licenses for such stations shall be granted on an experimental basis only, and for such period or periods of time as the Secretary of Commerce may determine."

SUBCOMMITTEE NO. 4: PROBLEMS OF MARINE COMMUNICATION

The committee has given consideration to the problems of marine communication committed to it by the conference and has made distribution to various marine services of the bands of frequencies (wave lengths) allocated for these purposes by committee No. 1.

It recommends that these frequencies (wave lengths) should be distributed in the following manner:

120–190 kc. (2,500–1,578 meters).	Were left unassigned, except as hereinafter stated, with the recommendations that allocations to the various marine services be made by the Department of Commerce.
160 kc. (1,874 meters) 175 kc. (1,713 meters) 185 kc. (1,621 meters)	For Governmental use. It was recommended that the wave length of 1,620 meters be used for ice-patrol broadcasting and for other navigational aid messages, but that neither of the three wave lengths should be exclusive.
235–285 kc. (1,276–1,052 meters).	For marine radiotelephony. It was recommended that specific allocations within this band should be made by the Department of Commerce and pending further developments should be tentative only.
343 kc. (875 meters) 410 kc. (731 meters) 454 kc. (660 meters)	For ship-to-ship and ship-to-shore communications.
425 kc. (705 meters)	It was recommended that ships now on 705 meters be transferred to the other assignments within a reasonable time.
300 kc. (1,000 meters)	For radio beacon, with a guard band of 125 meters below (to 343 kc.) against broad emissions and nonsimple harmonically modulated CW and of 52 meters above 1,000 meters (to 285 kc.). An exception of the 952-meter wave length assigned to Government use was approved. Where CW and simple harmonically modulated CW are employed, the 1,000-meter wave should be guarded by a frequency separation of 15 kc.
315 kc. (952 meters)	For Government use.

375 kc. (800 meters)	For radio compass, with a guard band of 70 meters below (to 411 kc.) and of 70 meters above (to 345 kc.) 800 meters against broad emissions and nonsimple harmonically modulated CW. Where CW and simple harmonically modulated CW are employed, the 800-meter wave should be guarded by a frequency separation of 15 kc.
445 kc. (674 meters)	For Government use upon aircraft and submarines, on CW, and ICW.
500 kc. (600 meters)	For calling and distress signals and messages relating thereto, exclusive.
2,500–2,750 kc. (120–109 meters).	For mobile marine services.

The question of decrement was considered, and upon motion it was voted to be the sense of the committee that in considering frequencies (wave lengths) of coastal stations a definite assignment of decrement for transmitters be fixed, beginning at 0.1 for higher frequency ranges (shorter wave lengths) and tapering to 0.08 for lower frequency ranges (longer wave lengths), and that the value of the decrement should be determined and assigned at the time the frequencies (wave lengths) were allocated to particular stations.

The committee made no definite assignment of frequencies (wave lengths) to coastal stations, but upon motion voted the sense of the committee to be that such assignments should be made by the Department of Commerce and that in such assignments, and also in the assignments of the frequencies (wave lengths) lying between 300 and 500 kilocycles (1,000 to 600 meters) for ship-to-ship and ship-to-shore service, the specific frequencies (wave lengths) recommended by the committee should be varied as circumstances and conditions should, in the judgment of the Secretary of Commerce, warrant.

The committee considered the question of the international abbreviations provided for in the London convention. It was believed that additional abbreviations should be made available immediately to American ships, and on motion the committee voted it to be the sense of the committee that two signals "QSYL____meters____" "Listen for me on____meters," and "QSYA____meters____" "Answer on____ meters" should be used, and that the entire question of the international abbreviations should be committed to the Department of Commerce for consideration and for such recommendations to the Berne bureau and to any international conference hereafter held as it might deem advisable.

The question of "TR" reports was brought to the attention of the committee. After discussion the committee, on motion, voted that it noted with approval the recent voluntary action in reducing the number of unnecessary TR reports, and recommended that such reduction be carried as far as possible. Following this motion it was voted that the transmission of such reports should be limited between 7 p. m. and 11 p. m., shore-station time, to cases of emergency.

The question of interference with broadcasting by harmonic radiation from various types of transmitters was discussed. It was voted that all CW and ICW transmitting sets for marine use on frequencies greater than 300 kilocycles (below 1,000 meters) should be so constructed and operated as to be substantially free from such harmonic radiation.

The question of the standards to be maintained in the issuance of operators' licenses and in particular the standards for commercial radio operators on shipboard was considered. The committee voted to recommend that the Department of Commerce make a study of this subject and report during the coming year.

SUBCOMMITTEE NO. 5; AMATEUR PROBLEMS

Subcommittee No. 5, amateur problems, has met and, being advised of the allocation of frequencies for amateur use by subcommittee No. 1, has considered amateur problems involving subdivision of types of transmitting apparatus and also various amateur technical problems.

We have found that most of the problems confronting the amateur are disciplinary in character and can best be handled within the amateur organization with the assistance of the chief supervisor of radio.

The committee has voted unanimously to recommend to the conference the following:

1. That the use of receivers capable of radiating be discouraged for use on the short wave relay broadcast bands.
2. Except in the case of transmitters using coil antennas or loops, the use of circuits loosely coupled to the radiating system, or devices producing an equivalent effect, shall be required in all amateur transmitters.
3. All of the amateur bands shall be open to telegraphic communication effected by means of tube transmitters or devices producing an equivalent effect, excepting those using outright forms of ICW by mechanically interrupting one of the radio-frequency circuits.
4. A band of 1,670 to 1,760 kilocycles (170 to 180 meters) shall be assigned nonexclusively to amateur radiotelephones and ICW stations which employ apparatus in which one of the radio-frequency circuits is mechanically interrupted.
5. The question of issuing one amateur station license which will permit of the use of all amateur wave bands is to be left to the discretion of the chief supervisor of radio.
6. The international intermediates that have been in use by the amateurs of the various nations in their international amateur radio communications and which were established unofficially by the American Radio Relay League should be continued, and it is requested that this matter be taken up by the Department of Commerce with the International Bureau at Berne to the end that they may be brought to the attention of the next International Radiotelegraphic Convention for official confirmation.

SUBCOMMITTEE NO. 6: INTERFERENCE PROBLEMS

The subcommittee on interference problems has given consideration to the subjects referred to it by the conference, together with others suggested by members of the committee itself, and submits the following report:

1. The sources of possible interference to radio reception which were considered are:

(A) Electrical devices other than radio transmitting stations.
(B) Radiating receiving sets.

(C) Spark transmitting sets.
(D) Arc transmitting sets.
(E) Broad band emission and harmonics.
(F) Variation from assigned frequency.
(G) Use of unnecessarily high power and careless testing.
(H) "Superpower" broadcasting stations.

These subjects will be considered in the order named.

(A) *Electrical devices other than radio transmitting stations.*—The National Electrical Light Association, through a radio subcommittee of its inductive coordination committee, has been making a study of reported cases of interference with radio reception where electrical devices or supply circuits appear to be involved. A report of this subcommittee is printed in the National Electrical Light Association Bulletin for August, 1924.

It is recommended that the conference membership generally agree to cooperate with the National Electrical Light Association in the collection and publication of information which will assist in locating the causes of interference of this nature and in reducing or eliminating the radiation from electrical equipment and appliances.

Much of the work in mitigation of such electrical interference results in an improvement in the operation of the electrical devices or supply lines and is thus a double gain. There are, however, some electrical devices which, even when in perfect working order, cause disturbances which result in interference with radio reception. In many cases it is possible to provide filters, shields, chokes, etc., either at the source of disturbance or at the receiving set which do much to relieve the difficulties. It is felt that every possible encouragement should be given to the organized technical study of these disturbances and to the publication of information as to satisfactory methods for minimizing such interference.

Part of the disturbance from electrical devices is practically inevitable and must be regarded, like atmospheric disturbances, as part of the inherent limitation of radio reception. In other words, the limitation upon radio reception is not only the distance and the power of the transmitting stations and the sensitiveness of the receiving set, but also the omnipresent background of slight electrical disturbances which drown out signals below a certain intensity. This background of electrical disturbances is the underlying reason why reception from local stations is inherently superior to reception from distant stations.

The ratio of signal energy to the energy of other electrical disturbances present is of first importance in this regard, and it is to be expected that the tendency toward higher power stations will have considerable effect in reducing instances of interference.

Much has been done in developing a measuring technique for locating and analyzing disturbances. The use of an exploring loop has proved essential. In the efforts to locate sources of disturbances it has been found important to use methods which will discriminate between effects arising from highly damped impulses and low frequency disturbances.

Such disturbances may be divided into two main heads—(1) momentary changes of electrical conditions producing a surge or swing of potential and (2) continuous cyclic disturbances due to induction.

It is of interest to call attention to the similarity of some of the disturbances in the first class above given to those known as atmospherics of the "rolling" or "grinder" types. It may be generally stated that any amelioration of static reactions in a receiver will usually show an improvement in immunity to momentary disturbances from sudden neighboring discharges, even of a continuous nature.

Radiations from X-ray or violet-ray machines act like those from sparking commutators, but normally operating mercury arc rectifiers, except when starting, do not seem to produce any disturbances. Preliminary investigations on **S**-tubes seem to show the same result.

Poorly bonded trolley tracks have also proved a source of trouble, but the remedy is self-evident and quickly applied, as it is a part of the routine replacements necessarily made from quite other considerations.

In the second class we have a more or less continuous disturbance which may be produced by induction from telephone ringing machine, light, power, and electric railway lines.

Continued and more extended cooperation between the Bureau of Standards, power, telephone, and railway utilities and the radio supervisors is recommended.

(B) *Radiating receiving stations.*—A detriment to radio reception is interference from radiating receivers. No type of receiver necessarily radiates of itself, but certain types may do so when improperly constructed or operated. These are types in which local oscillations either are produced continuously or may occur temporarily during adjustment. Even these types will not radiate when the oscillation is prevented from reaching the antenna circuit by the interposition of a one-way repeater tube, and they will ordinarily radiate too weakly to cause considerable interference when used in conjunction with a coil antenna instead of an open antenna.

It is recommended that manufacturers and home builders take steps to eliminate or at least minimize interference, particularly as follows:

(*a*) Particularly for receivers to be used in congested areas, preference should be given, as far as permitted by conditions of economy and convenience, to receiver types which can not radiate or can radiate only weakly.

(*b*) Receivers which continuously oscillate should be provided either with means for preventing the oscillations from reaching the antenna circuit or else with a coil antenna, or with both.

(*c*) Receivers which may oscillate temporarily during adjustment should be arranged so that such oscillation can readily be avoided by proper manipulation.

It is further recommended that the Department of Commerce, through its own publications and by continued cooperation with radio magazines, newspapers, and other publishing agencies, conduct a campaign of education directed to the owners of receivers which can radiate, instructing them in the nature of the interference which they cause and in the proper methods of operation to minimize or eliminate the interference.

(C) *From spark transmitting sets.*—The interference resulting from the use of damped wave transmitters has long been serious and almost came to be regarded as inevitable. It has been recently determined, however, that improvements can be made in this class of transmitters which materially reduce their decrement and consequently the interference resulting from their use. From consideration of interference alone it would be desirable if all damped wave transmitting sets were superseded by continuous wave transmitting sets, but it is recognized that such action can not be expected in the near future from considerations of economy alone. If the number of damped wave transmitting sets can be gradually reduced and the remaining transmitting sets of this class gradually improved in the quality of their emission, the situation will be much improved with little hardship to the owners of such stations. With a view to initiating such a policy the following recommendations are submitted:

(*a*) That in the future land stations in point-to-point service, other than those using CW, shall be limited to the use of waves of low equivalent decrement such as are produced by ICW installations.

(*b*) Whereas the national law of 1912 prescribed for damped emissions a decrement not exceeding 0.2 and whereas improvements in the radio art since that date have made it possible to reduce this decrement considerably, it is now recommended that mobile installations should have decrements not exceeding 0.14, and that coastal installations should have decrements not exceeding 0.10.

(*c*) The committee urges and strongly recommends that a reduction of the decrement in waves emitted by damped wave transmitters be progressively reduced as soon as practical below the limits recommended in the foregoing resolution and to the lowest practicable attainable values. It is further recommended that the next radio conference establish still lower values of decrement as appear suitable in view of progress and practical use of damped wave transmitters.

(D) *Arc transmitting sets* as generally employed in the past are productive of interference by reason of the spacing waves employed, their numerous harmonics, and parasitic radiation. Means have been developed in recent years to reduce the interference from these causes in arc transmitters to a point where they are no longer objectionable and at a reasonable expense. It is the sense of this committee that arc transmitters should be so equipped and so operated as to minimize or eliminate harmonic radiation, parasitic radiation, fluctuation of fundamental frequency, and spacing wave radiation, inasmuch as all of these constitute sources of interference.

Spacing waves result in practice only from arc transmitters in which two frequencies of oscillation are employed—one while the key is depressed and one when the key is open. The former provides the desired agency for signal transmission and the latter is ignored by the receiver. The spacing is just as productive of interference as the signal wave, however, and its use constitutes an economic use of the available band. Means have been developed for absorbing the energy of the converter in a local circuit, so that no energy is radiated except when the key is depressed. This arrangement has been successfully applied to arcs up to 200 killowatts in size, and there is little doubt but that it can be applied also to the largest sizes, although it involves considerable expense. It is recommended that the principle of a single working frequency for each complete transmitting system at any station (transmitting sets plus power equipmen plus antenna) be generally adopted and rigidly adhered to. If that be done, the spacing wave will be automatically forced out.

(E) *Broad band emission and harmonics.*—The width of frequency band emitted by a transmitting set varies from the extreme of a spark transmitting set on one side to the practically fundamental frequency of a key-modulated continuous wave tube transmitting set which is not forced to extreme output. Between these extremes lie the emission from arc transmitting sets, audibly modulated tube transmitting sets, and telephone transmitting sets. Although some of the interference from this source results from inherent characteristics of the apparatus used, much results from the use of apparatus purposely designed to emit bands sufficiently broad to be easily picked up by simple detectors as in the case of interrupted or audibly modulated continuous wave sets. Untrained operators, unsuitable receiving apparatus, and unstable transmitting systems are some of the reasons why audible modulation of CW transmission is employed. The same reasons can be advanced to justify spark transmission. Obviously, the use of any system of radiotelegraph transmission which becomes audibile only by detection and amplification requires a broader band than a system which requires heterodyning for audibility and is an uneconomical use of the available radio spectrum. The number of stations which may work without interference in the bands at present commonly employed can not be much increased unless broad band emission is relinquished in favor of pure continuous wave radiation. If any means can be found in addition to economic necessity to encourage the more general use of pure wave radiation for radiotelegraphy, it ought to be vigorously applied. Exception can well be made in favor of transmitting apparatus used for calling and distress only.

Interference from harmonics results from the emission of radio power on one or usually several frequencies higher than the fundamental frequency, but at less intensity than the fundamental. Any transmitting set, including tube transmitters, is subject to this fault if oscillating directly in the antenna circuit, and tube transmitters show the same tendency in addition when pushed to maximum output. The trouble can be practically overcome by the use of master oscillator-power amplifier systems and greatly improved by the use of loose coupling between oscillating and radiating systems. An effective remedy is so comparatively simple and inexpensive that it ought to be compulsory. If the principle of licensing a station to use only one frequency per complete transmitting system were rigidly applied, stations radiating harmonics could be dealt with because they are actually radiating appreciable power on frequencies other than that for which licensed.

Harmonics of the carrier wave of stations operating in the lower frequency range of the broadcast band, or in the marine frequency band, will fall within the range of the broadcast frequency band, and under certain conditions will prove to be a serious cause of interference. It is recommended that all possible steps be taken to minimize this trouble by technical means well known to the art and by careful supervision on the part of the radio supervisors.

In the marine telegraph service the substitution of tube transmitters for spark equipment greatly reduces interference, particularly where the CW system is employed. The use of modulated CW signals, while less productive of interference than spark equipment, is not recommended except where absolutely necessary.

(F) *Variation from assigned frequency.*—There are two classes of troubles from this source—that resulting from intentional unauthorized change and that resulting from unintentional variation. The former is much too prevalent. It is a common occurrence to find a station shifting to an unauthorized frequency owing to temporary interference or trouble with apparatus at the assigned frequency and then remaining there indefinitely if any advantage, real or fancied, is found. Government as well as commercial stations are guilty of this practice; possibly the former more so. In many cases the offending station is causing unknown interference to many others, although its own individual situation may be improved.

It would be desirable if some sort of penalty could be provided for this practice applicable both to Government and commercial stations. Military and naval operators can be reached through disciplinary methods, but civilian operators of the Government departments are not so easily disciplined. Commercial operators can be reached through their licenses. It is recommended that steps be taken to provide definite discipline for offenses of this character. It is felt that a better check on the use of unauthorized frequencies should be provided and that regular measurements and reports be made of the frequencies actually used by radio transmitting stations throughout the United States. It is believed that work of this character is a proper duty of the Department of Commerce radio service. If, however, the Department of Commerce is unable to undertake more extended work of this kind at the present time, it is urged that as a temporary measure cooperative arrangements be made by that department with other organizations operating radio stations, by which a systematic check may be obtained on the frequencies used by radio transmitting stations during the course of their operation.

Variations from assigned frequency through unsuspected changes in the transmitting apparatus is frequent but not often of great importance because the variation is usually comparatively small. Nevertheless, frequency allocations have been made on the basis of narrow margins between adjacent stations and this calls for maintenance of frequency within the closest possible limits. Progress in the design of measuring equipment and in the provision of standard frequencies has been rapid, and we recommend even more stringent regulations than now exist, coupled with the utmost zeal on the part of the Department of Commerce in the enforcement of the regulations on maintenance of assigned frequency.

(G) *Use of unnecessarily high power and careless testing.*—Unquestionably much interference now experienced is the result of using higher transmitting power than necessary. There is a noticeable tendency to provide sufficient power to maintain communication under unfavorable conditions and then to continue with that power through all the more favorable seasons. Control of power input necessarily rests usually with the operating personnel, and few operators will voluntarily reduce power for the possible accommodation of remote stations not in a position to make their troubles known directly. In fact, the use of sufficient power to get every signal through clearly without necessity for repetition is probably more conducive to reduction of interference than the use of less power which results in repetitions, and thereby consumes more time than necessary in clearing traffic. The happy medium between maximum power and insufficient power can only be achieved by constant supervision of operations by the responsible management assisted so far as possible by the inspectors of the Government. It is a very difficult situation to control by Government inspectors alone and the burden must be assumed primarily by the managements of stations.

Careless testing.—Interference from this source is similar to that from the use of excessive power in that it is usually under the direct control of an operator without due appreciation or respect for the rights of others. Much testing can be conducted without radiating power, and if testing with radiation could be confined to the actually necessary cases the interference from the source would probably be negligible, particularly if testing were conducted on the authorized frequency of the station. Care on the part of responsible managements that their operators are properly instructed in testing methods, combined with vigilance and report to supervisors on the part of all cognizant of such abuses, are about the only remedies which can be suggested.

For reporting cases of interference to station owners or to the Department of Commerce it is recommended that use be made of a form which gives complete details such as the attached form [illegible] the Interdepartment Radio Advisory Committee.

(H) "*Superpower*" *broadcasting stations.*—[illegible]
exists among broadcast listeners and owners of exi[illegible] broadcast
stations that the use of appreciably higher pow[illegible]
stations over that now permitted may adversel[illegible]
of a large number of listeners. The benefits to [illegible]
eral public from such action seem, however, to war[illegible]
ment of such a service in an experimental way, [illegible]
observation of results and its cessation if the benefits [illegible]
not attained without equal detriment in other [illegible] By [illegible]
of the lack of data in this field it seems unwise [illegible] this experi-
mental work by restrictions on the power [illegible] variation
of power with seasons or hours of the day, [illegible]
of increasing power as results seem to warran[illegible]
sential, however, to locate such stations at such [illegible]
lous centers that such centers will not be sub[illegible]
signals in excess of that now produced by auth[illegible]
their midst. From such data as are now available [illegible]
object will be attained if the station is so located with [illegible]
populous centers that the distance between it and the [illegible]
such community will not be less than the quotient obtained by [illegible]
ing the product of antenna current in amperes times effect[illegible]
tenna height in meters by a constant tentatively set at [illegible]
perience may make it advisable to modify this constant, b[illegible]
sufficiently conservative to serve for the initiation of th[illegible]
mental work.

2. Radio communication, both in broadcasting and in the transmission fields, has made great strides in the past fou[illegible]

The Bureau of Navigation of the Department of Commerce, in whose hands lies the regulation of radio, has accepted the tremendous task imposed by the growth of the art and has executed its trust with an admirable spirit and efficiency that is appreciated by all workers in the field. The extensions of the past year, however, have made increasingly evident the fact that the Bureau of Navigation is handicapped in its radio activities and that without further personnel and funds it will have grave difficulty in supervising the conduct of radio. Among the matters of growing importance that require increasingly close attention by the bureau are:

(*a*) Observation of interference caused intentionally.

(*b*) Determination of interference caused by accidental shifts of wave frequency.

(*c*) Determination of improper radiation of harmonic and parasitic waves, that may cause interference.

(*d*) Frequent inspection of radio stations and checking of their facilities.

Therefore, it is the sense of this committee that the Bureau of Navigation be encouraged and aided in its activities by more liberal appropriation of funds.

Report of radio interference and violations of radio laws and regulations

(Check appropriate item in each group and forward to--)

STATION PARTICULARS

Offending station	Station communicating with offending station	Reporting station
Call letters------------------	------------------	------------------------------
Name------------------	------------------	------------------------------
Frequency (kilocycles)----------	------------------	------------------------------
(Observed.)		(Receiving wave interfered with.)
Wave length (meters)----------	------------------	------------------------------
(Observed.)		(Receiving wave interfered with.)
System employed:		
Spark------------------	------------------	------------------------------
Arc------------------	------------------	------------------------------
Tube, CW------------------	------------------	------------------------------
Tube, IWC------------------	------------------	------------------------------
Tube, phone------------------	------------------	------------------------------
Approximate location----------	------------------	------------------------------

TIME AND NATURE OF INTERFERENCE OR VIOLATION

Interference		*Law or regulation violated*
—— Off of assigned wave.	Date------------------	Sec._ _of ship act of 7/23/12
—— Traffic not authorized on this wave.	Time------------------	Sec._ _of radio act of 8/13/12.
—— On assigned wave but interfering.	—— GMT.	Article .. of London Radio Convention of 1912
—— Broad wave.	—— Eastern.	Article .. of Service Regulations of London convention, 1912.
—— Arc mush.	—— Central.	Section .. of Radio Regulations of U. S. Dept of Commerce, edition Aug. 15, 1919.
—— Poor modulation.	—— Mountain.	Supplementary Radio Regulation of U. S. Dept. of Commerce, dated ------------
—— Harmonics.	—— Pacific.	Is interference or offense satisfactorily covered by law or regulation? Yes. No.
—— Frequency varies.	------------------	
—— Compensating wave.	How often does offense occur?	
------------------------------	------------------	

RECEIVING SET USED BY REPORTING STATION

NAME-PLATE DATA		
Receiving set------------------	—— Single circuit.	—— Crystal detector.
------------------------------	—— Two circuit.	—— Vacuum tube detector.
Detector------------------	—— Regenerative, nonoscillating.	—— Number of stages of radio-frequency amplification.
------------------------------	—— Regenerative, oscillating.	—— Number of stages of audio-frequency amplification.
Amplifier------------------	—— External heterodyne	

This space reserved for use by Washington office.

[Extract from communication causing interference or violation]

Call letters of other stations in vicinity which may have heard this interference or violation ____________________

Remarks ____________________

I hereby certify the above to be a true copy and to represent, to the best of my knowledge and belief, an accurate and full account of what occurred.

Dated ____________________, 19__.

____
(Officer in charge of station.)

This information will be helpful in improving traffic handling and operating conditions for both the reporting and the interfering stations. Prepared by Interdepartment Radio Advisory Committee, Washington, D. C.

SUBCOMMITTEE NO. 7 : INTERCONNECTION

Your committee appointed to study the problems of interconnection, both as to wires, radio, or other means, has established certain existing facts and conditions and recommends a definite procedure.

We repeat the remarks of the Secretary, that improvement in programs is essential, and that such improvement is more readily accomplished through the use of interconnecting means between broadcasting stations, bringing the programs of the larger centers of art, music, and events of public interest to the more remote broadcasting stations.

A brief history of the developments of interconnection of broadcasting stations is believed illuminating and essential as a premise on which to offer a constructive recommendation.

The use of wires in interconnecting broadcasting stations grew out of a desire on the part of program managers to introduce into their programs events which could not be brought to the studio. The first notable use of telephone wires over any appreciable distance was between Chicago and New York when the Princeton-Chicago football game, played in Chicago in the fall of 1922, was broadcast from a station in New York.

Coincidentally, the first use of telegraph wires to bring a program to a broadcasting station was in the fall of 1922, when the world series, played at the Polo grounds in New York, was broadcast from a station in Newark, N. J.

At about the same time the first experiments in radio interconnection were undertaken between Pittsburgh and Cleveland; but, being distinctly experimental in character, no definite requirement was met and no definite schedule arranged.

The first systematic interconnection of broadcasting stations by space radio was inaugurated in September, 1923, between Pittsburgh and Hastings, Nebr., this interconnection being accomplished without interference to other broadcasting stations or other radio services by means of short wave transmission.

In the case of wire interconnections the earlier service was limited to supplying a program to one distant station over a limited distance, but this means of interconnection has since been expanded to include stations from New York to San Francisco and as far south as Habana, Cuba, and from 1 to a total of 18 broadcasting stations simultaneously providing the same program or public event.

By means of radio interconnection programs produced in this country have been transmitted to England and South American countries where wire line interconnection was impossible. The programs transmitted on short waves were picked up and broadcast by long waves, in some instances, with the assistance of wire interconnection, by from two to eight stations. This development was notable in several respects:

First. The programs were internationally available, as European listeners had no difficulty in picking up and listening to the British stations.

Second. This was an example of a combination of wire and radio interconnection.

Third. This international distribution of a program was accomplished without interference to other radio services. It should be mentioned that various stations in the United States also picked up this transmitted program and rebroadcast it for general distribution over the United States.

Another notable example of development of international interconnection by radio occurred recently, when the Firpo-Wills contest, obviously of intense interest to Argentina, was broadcast from the ring side in the usual manner, employing wire interconnections from the ring side to the broadcasting station at Pittsburgh and transmitted by short wave radio to South America, where the words spoken by the announcer at the ring side were received and rebroadcast.

The first radio interconnection of more than two broadcasting stations occurred in 1923, when the speeches at a dinner in New York City were picked up and delivered to a local New York broadcasting station, which transmitted the program on its customary wave length. Simultaneously, this program was conveyed to Schenectady over telegraph wires and broadcast on both short and long waves. The short wave was picked up at Pittsburgh and again rebroadcast on short and long waves. This short-wave transmission was picked up at Hastings, Nebr., and rebroadcast on its usual long wave; and in the final step, Oakland, Calif., picked up the Hasting transmission and rebroadcast on its usual long wave.

At present certain telephone and telegraph wire facilities are available and in use. As examples, the Boston studio and the Springfield station are interconnected by means of telegraph wires; a station in New York and a station in Schenectady, and likewise stations in Washington and New York, are similarly connected by telegraph wires. This service is now in daily use, and programs are broadcast simultaneously from these interconnected stations. On numerous occasions within the last year events of public interest, two of the most recent being the National Defense Test Day exercises last month and the address of the Secretary of Commerce at the opening of this conference this week, have been distributed to over a dozen broadcasting stations by means of telephone wires. These speeches and exercises were thus made available to all radio listeners throughout the United States.

Great strides have been made in the development of the interconnection of broadcasting stations, nationally and internationally, by means of telephone or telegraph wires and radio, or combinations thereof. With certain limitations, facilities are now available and in use in serving a large portion of the United States, and it is anticipated that regular service of this character may be available to a sufficient number of stations in prominent centers in the near future to provide improved programs to a large portion of the country. It is felt that interconnection by these various means still presents many problems, and to encourage further development of these facilities your committee recommends that a continuing committee be appointed by the Secretary of Commerce to carry on the study of this development.

We have considered the suggestions made as to the advisability of cooperative action among the broadcasting stations looking to better programs, the handling of national events, the making available to local stations of the talent of great artists, and the hearing of important events occurring at a distance. All this involves the physical problem of interconnection, and, of equal importance, financial questions, such as the expense of the interconnection, the source of revenue, the payment of artists, and those arising from differences in time which affect simultaneous broadcasting and in some instances will require a sectional rather than a national view. There are many other features which necessarily arise when cooperative action is attempted. Manifestly it has been impossible for our committee to undertake any final determination of such matters. The feasibility and advisability of such a plan must be determined principally by the broadcasters themselves.

The suggestion of such coordinated effort, whether through the formation of an association or otherwise, deserves thorough consideration requiring much more time than your committee can give it. We recommend that the entire question be referred to the continuing committee already suggested.

We listened with great interest to the remarks of Capt. P. P. Eckersley, of the British Broadcasting Co., and particularly to his suggestion of the possibility of an extension of the development of simultaneous broadcasting in Great Britain and the United States, making programs produced in one country available at the same time to the other. We appreciate the wonderful possibilities of such a plan and can imagine the interest with which such a development would be received by the listening public. We recommend that this suggestion also be referred to the continuing committee hereinbefore mentioned for their consideration.

5. SUMMARY OF FREQUENCY OR WAVE LENGTH ALLOCATIONS

Kilocycles	Meters	Service
95–120	3,156–2,499	Government CW and ICW, exclusive.
120–157	2,499–1,910	Marine CW and ICW, exclusive.
157–165	1,910–1,817	Point-to-point CW and ICW. Marine CW and ICW. exclusive.
165–190	1,817–1,578	Point-to-point CW, ICW, spark. Marine CW and ICW. exclusive.
160	1,874	Government, nonexclusive.
175	1,713	Government, nonexclusive.
185	1,621	Government, ice patrol broadcasting and navigational aid messages, nonexclusive.
190–230	1,578–1,304	Government CW and ICW, exclusive.
230–235	1,304–1,276	University, college, and experimental CW and ICW, exclusive.
235–250	1,276–1,199	Marine, phone, nonexclusive.
250	1,199	Government, CW, ICW, nonexclusive.
250–275	1,199–1,090	Marine, phone, nonexclusive.
275	1,090	Government, CW, ICW, nonexclusive.
275–285	1,090–1,052	Marine, phone, nonexclusive.
285–500	1,052–600	Marine and coastal, including radio compass and radio beacons.
300	1,000	Radio beacons.
315	952	Government CW, ICW, spark.
343	874	Ship-to-ship and ship-to-shore CW, ICW.
375	800	Radio compass.
410	731	Ship-to-ship and ship-to-shore CW, ICW, spark, exclusive.
425	705	Ship-to-ship and ship-to-shore CW, ICW, spark, exclusive.
445	674	Government aircraft and submarines, CW and ICW.
454	660	Ship-to-ship and ship-to-shore CW, ICW, spark, exclusive.
500	600	For calling and distress signals and messages relating thereto, exclusive.
500–550	600–545	Aircraft and fixed safety-of-life stations, CW, ICW, phone, exclusive.
550–1,500	545–200	Broadcasting services, phone, exclusive.
550–1,070	545–280	Class 1.
1,0[illegible]–1,400	275–214	Class 2.
1,4[illegible]–1,460	211–205	Class 3.
1,500–2,000	200–150	Amateur, exclusive.
1,500–1,670	200–180	Amateur CW, ICW.
1,670–1,760	180–170	Amateur, ICW, phone.
1,760–2,000	170–150	Amateur, CW, ICW.
2,000–2,250	150–133	Point-to-point, nonexclusive.
2,250–2,500	133–120	Aircraft, exclusive.
2,500–2,750	120–109	Mobile.
2,750–2,850	109–105	Relay broadcasting, exclusive.
2,850–3,500	105–85.7	Public service.
3,500–4,000	85.7–75.0	Amateur and Army mobile.
4,000–4,500	75.0–66.6	Public service and mobile.
4,500–5,000	66.6–60.0	Relay broadcasting, exclusive.
5,000–5,500	60.0–54.5	Public service.
5,500–5,700	54.5–52.6	Relay broadcasting, exclusive.
5,700–7,000	52.6–42.8	Public service.
7,000–8,000	42.8–37.5	Amateur and Army mobile.
8,000–9,000	37.5–33.3	Public service and mobile.
9,000–10,000	33.3–30.0	Relay broadcasting, exclusive.
10,000–11,000	30.0–27.3	Public service.
11,000–11,400	27.3–26.3	Relay broadcasting, exclusive
11,400–14,000	26.3–21.4	Public service.
14,000–16,000	21.4–18.7	Amateur.
16,000–18,000	18.7–16.7	Public service and mobile.
18,000–56,000	16.7–5.35	Beam transmission.
56,000–64,000	5.35–4.69	Amateur.
64,000–infinity	4.69–0	Beam transmission.

NOTE.—Further details are given in the various subcommittee reports on preceding pages.

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PROCEEDINGS
OF THE
FOURTH NATIONAL RADIO CONFERENCE
AND
RECOMMENDATIONS FOR REGULATION OF RADIO

▼

Conference called by
HERBERT HOOVER
SECRETARY OF COMMERCE

▼

Washington, D. C., November 9-11, 1925

DEPARTMENT OF COMMERCE
UNITED STATES OF AMERICA

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FOURTH NATIONAL RADIO CONFERENCE

PROCEEDINGS AND RECOMMENDATIONS FOR REGULATION OF RADIO

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1. OPENING ADDRESS BY HERBERT HOOVER, SECRETARY OF COMMERCE

This is the fourth annual occasion upon which I have had the pleasure of calling together the National Radio Conference for consultation with the Department of Commerce in the solution of the ever new problems which have developed in the growth of this astonishing industry.

We have great reason to be proud of the results of these conferences. From them have been established principles upon which our country has led the world in the development of this service. We have accomplished this by a large measure of self-government in an art and industry of unheard of complexity, not only in its technical phases but in its relations both to the Government and the public. Four years ago we were dealing with a scientific toy; to-day we are dealing with a vital force in American life. We are, I believe, bringing this lusty child out of its swaddling clothes without any infant diseases. We have not only developed, in the conferences, traffic systems by which a vastly increasing number of messages are kept upon the air without destroying each other, but we have done much to establish the ethics of public service and the response of public confidence.

Some of our major decisions of policy have been of far-reaching importance and have justified themselves a thousandfold. The decision that the public, through the Government, must retain the ownership of the channels through the air with just as zealous a care for open competition as we retain public ownership of our navigation channels has given freedom and development in service that would have otherwise been lost in private monopolies. The decision that we should not imitate some of our foreign colleagues with governmentally controlled broadcasting supported by a tax upon the listener has secured for us a far greater variety of programs and excellence in service free of cost to the listener. This decision has avoided the pitfalls of political, religious, and social conflicts in the use of speech over the radio which no Government could solve—it has preserved free speech to this medium.

While we have reason to congratulate ourselves on the success of past conferences and on the results that have come from them, we still have difficulties to face and overcome; but before I come to a discussion of them it seems proper to describe some of the progress in the various branches of radio during the 12 months past. We will thus logically arrive at existing conditions and present problems which now press for solution.

TELEGRAPHIC RADIO

EXPANSION OF INTERNATIONAL COMMUNICATION BY RADIOTELEGRAPH

The rapid extension in the international field by American radiotelegraph companies, which has already given us a dominant position, has continued during the past year. Public service has been inaugurated with Colombia, Honduras, Costa Rica, and Nicaragua. We have reason to hope that connection with Guatemala will soon be effective, thus forging another link in the communication chain which binds us to our friends in Central America. Direct service with Sweden commenced last December, and other European, South American, and trans-Pacific services have continued their effectiveness. Enterprises have been undertaken in the Philippines and in China. Altogether we will, by another 12 months, have systematic radiotelegraphic communication with nearly every important country in the world—a matter of vast importance, for it increases the movement of ideas as well as business. We have no pressing problems before us in this field.

CLEARING THE BROADCASTING BAND OF CODE SIGNALS

There has been a gratifying improvement in the character of equipment used in marine communication, which has tended somewhat to reduce annoying interference to broadcasting from the source and to improve that service itself. The re[illegible]ndations made by the conference a year ago that ships [illegible] stations should cease to use 300 and 450 meters have been [illegible] our own vessels, and reciprocal arrangements have [illegible] with Great Britain, Canada, and Newfoundland [illegible] sels of those countries will no longer use these troubl[illegible] in Morse code communication off our coasts. I am [illegible] understandings may be reached with other nations whose [illegible] our shores. A few months ago we reached an informal ag[illegible] with Canada relating to radio use by vess[illegible] shore stati[illegible] the Great Lakes by which 600 meters was [illegible] spark discouraged, and communications placed on [illegible] ers—one more example of the friendly cooperat[illegible] our northern neighbor which has always [illegible] relationships.

The 600-meter wave length is to-day used almost [illegible] calling and distress work, there being very little other [illegible] on it. Individual working channels have been assigned [illegible] Atlantic coastal stations, and traffic is handled more readily [illegible] considerably less interference. This plan is being extended [illegible] South Atlantic, Gulf, and Pacific stations. It is a very real [illegible] both in the clearing up of another of the sources of interference with telephone broadcasting and in the introduction of more order into marine communication.

TELEPHONIC RADIO

It is in broadcasting, of course, that we have agai[illegible] important changes and in which we again develop the [illegible] problems. There has been some improvement on the [illegible]

Better means of enabling the stations to maintain their assigned frequencies have eliminated much beat note interference. Increase in the frequency range of receiving sets is making the shorter wave lengths of the broadcasting band more available. Improvement in sets has given far greater perfection in tone and quality. Experimental work in the high frequencies is giving encouragement to the further development of the art.

The most profound change during the year, however, has been the tremendous increase in power and the rapid multiplication of powerful stations. When the conference assembled a year ago, there were 115 stations equipped to use 500 watts or more. Now we have 197 such stations, an increase during the year of over 70 per cent. This mere numerical expansion of stations falls far short of telling the whole story. A year ago only two stations were equipped to use an excess of 500 watts. Of the new stations 32 are equipped to use 1,000 watts, 25 to use 5,000 watts, and 2 a still higher power, making 59 in all against 2 last year. Taking the situation as a whole, we find that a year ago all stations of 500 watts and over were using a total of 67,500 watts. To-day they use 236,500 watts, or a 250 per cent increase.

A year ago we were fearful of the effect of greater power. We were told by some that the use of anything more than 1,000 watts would mean excessive blanketing, the blotting out of smaller competitors, the creation of large areas into which no other signals could enter. Some of the most pessimistic even warned us that our tubes would explode under the impact of this tremendous force. But our experience so far leads to the opinion that high power is not only harmless in these respects but advantageous. Power increase has meant a general rise in broadcasting efficiency; it has meant clearer reception; it has helped greatly to overcome static and other difficulties inherent in summer broadcasting, so as to give us improved all-year service. Whatever the limit may be, I believe that substantial power increase has come to stay, and the public is the gainer from it.

SERVICE AREA

Our experience during the year has somewhat more clearly defined the geographical area within which a single broadcasting station can give complete service, and by "complete service area" I mean the territory within which the average set can depend upon getting clear, understandable, and enjoyable service from the station, day or night, summer or winter. I do not include radio golf around the edge of these areas in our conception of public service—that game is an exercise of skill and the efficiency of your set plus a gamble on the radio weather, but we are not here concerned with it. Actual operation of high-powered stations has proven advantageous in broadening the "complete service area," but this area is much more limited than many expected. Subjected to the test of positive and reliable service at all times and all weathers, it will be found that the real effectiveness of a station falls within a comparatively small zone.

What these maximum areas of positive service are we do not yet know with any precision. The Bureau of Standards has recently carried on some rather extensive tests and has accumulated some interesting information, though it is not yet ready to give us any definite figures. If, however, we set up the most rigid standard of, say, complete service in adverse atmospheric conditions and all times of day and year for the average crystal set, then the bureau's actual intensity measurements would seem to indicate that this radius of the circle served by a 500-watt station will not exceed 10 miles, and that a 5,000-watt station will cover about 30 miles and 50,000-watt stations will not cover much over 100 miles. Obviously, more sensitive receiving sets or better atmospheric conditions at once greatly extend these distances.

For some reason or other the area is not always a circle, as you know, and it varies in different parts of the country for the same power. The department is undertaking the important task of determining these service areas, and you will have an opportunity while here of inspecting some of the equipment we are using for this purpose. I am in hopes that we can secure the resources this year to continue the study further. It will give us information on which to base more efficient allocation of wave lengths. In any event it is obvious that, barring revolutionary discoveries, it is certain that the country must continue to be served with local stations.

SCIENTIFIC INVESTIGATION

No discussion of progress in radio would be complete without an appreciation of the intensive scientific and industrial research now in progress in our universities and in the great laboratories of our commercial concerns, notably the General Electric, Western Electric, Westinghouse, and others, and, I might add, in our own Bureau of Standards. The vast expenditure of money and skill in our great industrial laboratories is not only advancing the application of the art but has been conceived in a fine sense of contribution to fundamental science itself.

PROBLEMS FOR THE INDUSTRY

The problems in broadcasting are, as ever before in these conferences, of two categories—those, on the one hand, which the industry can and should solve for itself in order to safeguard the public service and its own interest and, on the other hand, those which can only be solved in cooperation with the Government; and again, as before, we should find the solution of as many of our problems as we can in the first category. I have no hesitation in discussing these questions, because, as I have said, the more the industry can solve for itself the less will be the burden on the Government and the greater will be the freedom of the industry in its own development.

INTERCONNECTION

One of the problems which we considered at the last conference was that of interconnection. This has proceeded during the year in splendid fashion without any necessity of artificial stimulation. A year ago interconnection between stations was only occasional and was a great curiosity. Now it is commonplace. It is becoming more systematized and has gone far toward the creation of long-linked systems which will finally give us universal broadcasting of nation-wide events. The number of people who throbbed with joys and sorrows at the dramatic presentation of minute-to-minute events of the world's series is one of the most astonishing landmarks in radio broadcasting.

ADVERTISING

Another problem for solution by the industry itself and which now rests prominently on the public mind is that of advertising. There lies within it the possibility of grave harm and even vital danger to the entire broadcasting structure. The desire for publicity is the basic motive and the financial support for almost all the broadcasting in the country to-day. Publicity largely provides the cost of broadcasting which might otherwise fall upon the listener, who now pays nothing, much as the advertiser does in the case of the newspaper or magazine. Whether an individual accomplishes his purpose through the building and operating of his own station or by hiring time on one already built by somebody else makes little difference.

But the radio listener does not have the same option that the reader of publications has—to ignore advertising in which he is not interested—and he may resent its invasion of his set. It has been pointed out over and over again in previous conferences, and it might well be reiterated by this one, that advertising in the intrusive sense will dull the interest of the listener and will thus defeat the industry. Furthermore, it can bring disaster to the very purpose of advertising if it creates resentment to the advertiser. If we can distinguish, on the one hand, between unobtrusive publicity that is accompanied by a direct service and engaging entertainment to the listener and unobtrusive advertising, on the other, we may find solution. I believe the conference could well consider a definition of this distinction all along the line.

REMOVAL OF STATIONS FROM CONGESTED AREAS BY REMOTE CONTROL

Another problem that the industry could quite well stimulate is the removal of stations from congested centers. Blanketing of reception is inevitable within some short range of every station, and when it is in town it affects thousands of people. Remote control has developed to the point where city studios operate perfectly with the transmitters far outside the city limits. I look forward to the not distant time when all stations of sufficient size to cause disturbance will be banished from the cities and when their blanketing annoyances will cease. The conference could render a definite service by formulating proposals to that end.

PROBLEMS FOR SOLUTION BY COOPERATION WITH THE GOVERNMENT

My major purpose to-day is to discuss those problems which must be solved in cooperation with the Government.

THE AIR TO-DAY OVERCROWDED

Up to the present time we have had a policy of absolute freedom and untrammeled operation, a field open to all who wished to broadcast for whatever purpose desired. I am convinced that policy was sound. It resulted in a wonderfully extensive development which could have been obtained in no other way. We have to-day 578 stations, and as no more than four of them are under the same management no one can say there is not plenty of competition. To-day every solitary channel in the ether is occupied by at least one broadcasting station and many of them by several. Of the 578 stations 197 are using at least 500 watts of power, and there are now pending before the Department of Commerce over 175 applications for new licenses.

Higher power has greatly strengthened the service to listeners, but it has aggravated the problem of providing lanes through the traffic, for geographical separation must be greater. Heretofore it has been possible to duplicate channels geographically to a large extent among those using 500 watts, but with the increase of power this system becomes more and more difficult, for the borderland of interference is wider spread. We must face the actualities frankly. We can no longer deal on the basis that there is room for everybody on the radio highways. There are more vehicles on the roads than can get by, and if they continue to jam in all will be stopped.

It is a simple physical fact that we have no more channels. It is not possible to furnish them under the present state of technical development. It takes no argument to demonstrate that 89 wave lengths (and no more are available) can not be made to serve innumerable stations, no matter how ingenious we may be in arranging time divisions and geographical separations. It is not a question of what we would like to do but what we must do.

One alternative, which would only partly solve the problem, would be to increase the number of stations by further dividing the time of the present stations down to one or two days a week or one or two hours a day. From the listener's viewpoint, and that is the only one to be considered, he would get a much degenerated service if we were to do that. It is quality of program, location, and efficiency of transmission that count. None of these will be improved, and in most cases they will be ruined by introducing more stations to traverse the same channels. A half dozen good stations in any community operating full time will give as much service in quantity and a far better service in quality than 18, each on one-third time.

As the art progresses the capital investment in a good station has risen to upward of $150,000, and to provide technical staff, good talent, and interconnection the cost of operation has risen to as much as $100,000 per annum, and frequently even more. The costs are in large part the same whether the station works one day in a week or seven. If we impose more division of time than at present, we shall drive the best stations out of action, and the public will be more poorly served. The choice is between public interest and private desire, and we need not hesitate in making a decision. There are, of course, some stations of special character which can divide time, but they do not often lie in congested territory.

It has been suggested that the remedy lies in widening the broadcasting band, thus permitting more channels and making it possible to provide for more stations. The vast majority of receiving sets in the country will not cover a wider band, nor could we extend it without invading the field assigned to the amateurs, of whom there are thousands and to whose constant experimentation radio development is so greatly indebted. Radio in this branch has found a part in the fine development of the American boy, and I do not believe anyone will wish to minimize his part in American life.

If we did absorb the upper amateur band from 150 to 200 meters, it would not even solve the immediate difficulties. All these things bring us face to face with the problem which we have all along dreaded and for which we have hoped the development of the art might give us a solution; but that appears to be far off, and we must now decide the issue of whether we shall have more stations in conflicting localities until new discoveries in the art solve the problem.

We hear a great deal about the freedom of the air; but there are two parties to freedom of the air, and to freedom of speech, for that matter. There is the speechmaker and the listener. Certainly in radio I believe in freedom for the listener. He has much less option upon what he can reject, for the other fellow is occupying his receiving set. The listener's only option is to abandon his right to use his receiver. Freedom can not mean a license to every person or corporation who wishes to broadcast his name or his wares, and thus monopolize the listener's set.

We do not get much freedom of speech if 50 people speak at the same place at the same time, nor is there any freedom in a right to come into my sitting room to make a speech whether I like it or not. So far as opportunity goes to explain one's views upon questions of controversy, political, religious, or social, it would seem that 578 independent stations, many competing in each locality, might give ample opportunity for great latitude in remarks; and in any event, without trying out all this question, we can surely agree that no one can raise a cry of deprivation of free speech if he is compelled to prove that there is something more than naked commercial selfishness in his purpose.

The ether is a public medium, and its use must be for public benefit. The use of a radio channel is justified only if there is public benefit. The dominant element for consideration in the radio field is, and always will be, the great body of the listening public, millions in number, countrywide in distribution. There is no proper line of conflict between the broadcaster and the listener, nor would I attempt to array one against the other. Their interests are mutual, for without the one the other could not exist.

There have been few developments in industrial history to equal the speed and efficiency with which genius and capital have joined to meet radio needs. The great majority of station owners to-day recognize the burden of service and gladly assume it. Whatever other motive may exist for broadcasting, the pleasing of the listeners is always the primary purpose. There is a certain analogy to our newspapers and periodicals, but the analogy is not complete. A newspaper survives upon the good will of its subscribers. It has intimate knowledge of their number, and there is a delicate and positive sensitiveness in the reflex of their good will or ill will; but the broadcasting station has little knowledge of the number of its listeners and much less ability to judge their ill will or good will. There is no daily return of rise and fall in circulation. If some one could invent a method of accurate touch, it might solve our problems, for I am convinced that some stations are broadcasting not to receiving sets but only to the ether.

The greatest public interest must be the deciding factor. I presume that few will dissent as to the correctness of this principle, for all will agree that public good must overbalance private desire; but its acceptance leads to important and far-reaching practical effects, as to which there may not be the same unanimity, but from which, nevertheless, there is no logical escape.

WHAT ARE WE TO DO?

We simply must say that conditions absolutely preclude increasing the total number of stations in congested areas. It is a condition, not an emotion; but this implies a determination of who shall occupy these channels, in what manner, and under what test.

I can see no alternative to abandonment of the present system, which gives the broadcasting privilege to everyone who can raise the funds necessary to erect a station, irrespective of his motive, the service he proposes to render, or the number of others already serving his community. Moreover, we should not freeze the present users of wave lengths permanently in their favored positions irrespective of their service. That would confer a monopoly of a channel in the air and deprive us of public control over it. It would destroy the public assurance that it will be used for public benefit. There are, indeed, many difficult issues to be solved, but we have to face them just the same.

It seems to me we have in this development of governmental relations two distinct problems. First, is a question of traffic control. This must be a Federal responsibility. From an interference point of view every word broadcasted is an interstate word. Therefore radio is a 100 per cent interstate question, and there is not an individual who has the most rudimentary knowledge of the art who does not realize that there must be a traffic policeman in the ether, or all service will be lost in complete chaos of interference. This is an administrative job, and for good administration must lie in a single responsibility.

The second question is the determination of who shall use the traffic channels and under what conditions. This is a very large discretionary or a semijudicial function which should not devolve entirely upon any single official and is, I believe, a matter in which each local community should have a large voice—should in some fashion participate in a determination of who should use the channels available for broadcasting in that locality.

In other words, the ideal situation, as I view it, would be traffic regulation by the Federal Government to the extent of allotment of wave lengths and control of power and the policing of interference, leaving to each community a large voice in determining who are to occupy the wave lengths assigned to that community. It is true, of course, that radio is not circumscribed by State lines and still less by city boundaries; but it is possible, nevertheless, to establish zones which will at least roughly approximate the service areas of stations and to a very considerable extent to intrust to them the settlement of their local problems.

I am seeking your view as to how far this can be made practicable or what other basis may be found for handling the problem. I have no frozen views on radio, except that the public interest must dominate. As many of you know, I am not one of those who seek to extend any sort of Government regulation into any quarter that is not vital, and in this suggestion I am even endeavoring to create enlarged local responsibility.

Much work has been done in past sessions of Congress looking to radio legislation. I can not speak too highly of the constructive effort expended by Representative Wallace White and his committee associates in the study of radio needs and the preparation of measures to meet them; but until the present time I think we have all had some feeling of doubt as to the precise course which legislation should take, for changes have been so rapid and conditions so shifting that no one was ready to try to chart an exact course. I am glad that Congressman White and other members of the House and Senate committees are with us in this conference. I am certain that they have a hearty sympathy with, and understanding of, the actual needs of the radio public.

To sum up, the major problems for consideration are, to my mind: (*a*) Is public interest paramount? (*b*) Shall we limit the total number of stations in each zone pending further development of the art? (*c*) What basis shall be established for determining who shall use the radio channels? (*d*) What administrative machinery shall we create to make the determination?

2. PROCEEDINGS OF THE CONFERENCE

The Fourth Annual Radio Conference convened in Washington, D. C., at the building of the United States Chamber of Commerce, from November 9 to November 11, 1925. Approximately 500 persons were present, representing the many interests concerned with the use of radio. These included representatives of the listeners through broadcast listeners associations, radio publications and newspapers with radio sections, broadcasting stations of all classes, amateurs, manufacturers, engineering societies, Government departments, Members of Congress, and representatives from Canada, Cuba, and Mexico.

The opening session of the general conference, aside from the address by Secretary Hoover and the naming of committees, was largely devoted to discussion, without action, of the following questions:

(1) Is it essential to limit the number of broadcasting stations in order to prevent further congestion?

(2) If stations are to be limited in number, should the public interest, as represented by service to the listeners, be the basis for the broadcasting privilege?

(3) Should regional committees, familiar with the situation and needs of their communities, be established as advisory to the Secretary of Commerce in passing upon applications for broadcasting licenses?

RESOLUTIONS

During the proceedings the following resolutions were presented and acted upon:

(*a*) Paul B. Klugh, executive chairman, National Association of Broadcasters, presented for recording only resolutions adopted by that association, as follows:

Resolved, That it be the sense of the National Association of Broadcasters that in any congressional legislation or pending such legislation that the test of the broadcasting privilege be based upon the needs of the public served by the proposed station. The basis should be convenience and necessity, combined with fitness and ability to serve, and due consideration should be given to existing stations and the services which they have established; and be it further

Resolved, That full authority be vested in the Secretary of Commerce to act upon broadcasting license applications; that he should be authorized to use such means as he deems proper to ascertain the broadcasting needs of the communities in which licenses are sought, with due provision for court appeals; and be it still further

Resolved, That we recommend that legislation be proposed to Congress enacting into law the sense of these resolutions.

The second resolution:

Whereas it is universally agreed that the success of radio broadcasting is founded upon the maintenance of public good will and that no broadcasting station can operate successfully without an appreciative audience; and

Whereas the public is quick to express its approval or disapproval of broadcast program: Therefore be it

Resolved, That it is the sense of this meeting that any agency of program censorship other than public opinion is not necessary and would be detrimental to the advancement of the art; and be it further

Resolved, That inasmuch as it is necessary that the name of user of the station be connected, by suitable announcement, with the program in order to derive good will, and, furthermore, inasmuch as any such announcement or program if improperly presented will create ill will, there seems no necessity for any specific regulation in regard to form of announcement in connection with such paid or any other program.

(*b*) H. Umberger, Kansas State College, speaking on behalf of the Department of Agriculture, the farmers, and agricultural colleges using radio, presented the following:

Whereas the Federal Government, through the United States Department of Agriculture, and the State governments, through the State university, agricultural colleges, and departments of agriculture, are conducting public extension services in the distribution of material of an educational, informative, and economic character; and

Whereas the United States Congress and all State legislatures have provided for these services through appropriations approximating more than $100,000,000 annually, of which $7,000,000 is for current support and equipment for the colleges and universities, $9,000,000 for the experiment stations, and $23,000,000 for service and research by the Federal Department of Agriculture, in addition to hundreds of millions of dollars in permanent equipment; and

Whereas the distribution of the information gathered by these agencies to the public, particularly the rural districts, is a matter of national importance; and

Whereas radio broadcasting presents a most satisfactory and economical method of reaching the public with this important information and of making effective the public investment in these agencies; and

Whereas these institutions have immediately at hand among their regular staffs abundant material for educational and public service programs with practically no additional cost; Therefore be it

Resolved (1), That full recognition should be given by the Department of Commerce to the needs of these services, and (2) that adequate, definite, and specific provision should be made for these services within the broadcast band of frequencies.

The resolution was referred to Committee No. 1: Allocation of frequency or wave-length bands.

(*c*) George Schubel, director of station WHN, New York, N. Y., presented the following:

Resolved, That regional committees, constituted of broadcasting station owners familiar with the situation and needs of their communities, be established as advisory to the Secretary of Commerce in passing upon applications for new licenses, in the adjustments of interference problems, in the correction of local abuses, in coordinating radio service, developing broadcasting ideas, better programs, studying superpower, recommendations for the issuance of new licenses, and all such other matters needing regional consideration; and be it further

Resolved, That these regional committees be established according to the present boundaries of the radio districts in which the station operates; and be it still further

Resolved, That the radio supervisor of each radio district be chairman of such regional committee.

A resolution on this same subject was also adopted by Committee No. 4. (See page 23.) Both resolutions were referred to Committee No. 8: Legislation.

(*d*) C. R. Fountain, station WMAZ, Macon, Ga., presented the following:

> Whereas the Secretary of Commerce has asked this conference for advice in regard to certain general methods for ameliorating the present congested conditions in the realm of radio broadcasting; and
>
> Whereas after due and careful consideration by representative committees this conference has expressed its beliefs relative to these general methods, such as the non-issuance of additional broadcasting licenses, the freedom from further division of time with other broadcasters, the maintenance of the present distribution of frequency channels, etc.: Therefore be it
>
> *Resolved*, That the members of this conference express to the Secretary their appreciation of this opportunity for offering their suggestions and pledge him their best efforts to help carry out the various provisions thereof; and be it further
>
> *Resolved*, That the members assure him of their hearty approval and cooperation in any individual deviations from these provisions if, in his judgment, greater service may be rendered the public thereby.

The resolution was agreed to by the conference.

3. REPORTS OF COMMITTEES

The following committee reports, adopted by the conference, embody the recommendations of the conference for the regulation of radio:

COMMITTEE NO. 1: GENERAL ALLOCATION OF FREQUENCY OR WAVE-LENGTH BANDS

1. In view of the fact that radio development during the past year has been in general harmony with the allocation of communication channels suggested by the Third National Radio Conference, the present committee has had to recommend only minor changes in that allocation. The discussions have involved three major problems.

2. The first of these is the matter of extending the band of frequencies assigned to broadcasting. The committee recognizes that extensions of this kind would permit the operation of additional broadcasting stations or the relief to some degree of the present condition of overcrowding. Nevertheless, no additional channels were found available for broadcasting except by sacrifice of the major wave band used by the amateurs, and careful analysis showed that even if this entire band were to be transferred to broadcasting the contribution toward the reduction of interference would be relatively slight. Furthermore, any such change in broadcasting channels would inevitably render, at least partially, obsolete the millions of broadcasting receiving sets now in use. No benefit proportionate to the certain damage could be found, and consequently the broadcasting wave band was not changed.

3. The second important matter given consideration by the committee was a slight rearrangement of the various-frequency bands for the better accommodation of the Government services. With the cooperation of the representatives of the various departments concerned, the committee arrived at the allocations stated in the table given below. It is thought that these adequately provide for all essential services.

4. The third matter treated was the utilization of the frequency bands above 2,000 kilocycles (below 150 meters). Certain additional services are placed in some of these bands. Special thought was given to the application of the ultra-high frequency bands to beam and amateur services. It was concluded that certain of these channels should be available for experimental work other than beam transmission, and the allocations were accordingly modified in that respect. The committee appreciates that the allocations above 2,000 kilocycles (below 150 meters) must be considered to some extent temporary or experimental.

5. The committee recommends that the services above 1,500 kilocycles (below 200 meters) use only CW, ICW, and phone transmission.

6. The committee recommends affirmative action by the conference on the resolution quoted on page 11, submitted by Mr. H. Umberger on provision for adequate broadcast dissemination of agricultural educational information.

7. The committee recommends, provided it can be demonstrated to the satisfaction of the Department of Commerce, that no other wave band than 1,500 to 1,750 kilocycles (200 to 171 meters) can be used to provide satisfactory commercial radio telephony between the Hawaiian Islands, that portion of the allocation to amateurs be assigned such commercial radio telephony in the Hawaiian district only.

TABLE

Kilocycles	Meters	Type of transmission	Service	Remarks
95–120	3,156–2,499	CW and ICW	Government only	
120–153	2,499–1,960	CW and ICW	Marine and aircraft only	
125	2,399	CW	Government	Nonexclusive.
153–165	1,960–1,817	CW and ICW	Point to point, marine, and aircraft, only.	
155	1,934	CW and ICW	Government	Do.
165–190	1,817–1,578	CW and ICW	Point to point and marine only	
175	1,713	CW and ICW	Government	Do.[1]
190–230	1,578–1,304	CW and ICW	Government only	
230–235	1,304–1,276	CW and ICW	University and college experimental only.	
235–285	1,276–1,052	Phone	Marine only	
245	1,224	CW and ICW	Government	Do.
275	1,090	CW and ICW	do	Do.
285–500	1,052–600		Marine and coastal only	
300	1,000	CW and ICW	Beacons only	
315	952	CW and ICW	Government only	
343	874	CW and ICW	Marine only	
375	800	CW and ICW	Radio compass only	
410	731	CW, ICW, spark	Marine only	
425	706	CW, ICW, spark	do	
445	674	CW and ICW	Government	Do.
454	660	CW, ICW, spark	Marine only	
500	600	CW, ICW, spark, phone.	Calling and distress, and messages relating thereto, only.	
500–550	600–545	CW, ICW, phone	Aircraft and fixed safety of life stations	Do.
550–1,500	545–200	Phone	Broadcasting only	
1,500–2,000	200–150	CW, ICW, phone	Amateur only	
2,000–2,250	150–133		Point to point	Do.
2,250–2,300	133–130		Aircraft only	
2,300–2,750	130–109		Mobile and Government mobile only.	
2,750–2,850	109–105		Relay broadcasting only	
2,850–3,500	105–85.7		Public toll service, Government mobile, and point-to-point communication by electric power supply utilities, and point-to-point and multiple-address message service by press organizations, only.	
3,500–4,000	85.7–75.0		Amateur, Army mobile, naval aircraft, and naval vessels working aircraft, only.	
4,000–4,525	75.0–66.3		Public toll service, mobile, Government point to point, and point to point public utilities.	Do.
4,525–5,000	66.3–60.0		Relay broadcasting only	
5,000–5,500	60.0–54.5		Public toll service only	
5,500–5,700	54.5–52.6		Relay broadcasting only	
5,700–7,000	52.6–42.8		Point to point only	
7,000–8,000	42.8–37.5		Amateur and Army mobile only	
8,000–9,050	37.5–33.1		Public toll service, mobile, Government point to point, and point-to-point public utilities.	Do.
9,050–10,000	33.1–30.0		Relay broadcasting only	
10,000–11,000	30.0–27.3		Public toll service only	
11,000–11,400	27.3–26.3		Relay broadcasting only	
11,400–14,000	26.3–21.4		Public service, mobile, and Government point to point.	Do.
14,000–16,000	21.4–18.7		Amateur only	
16,000–18,100	18.7–16.6		Public toll service, mobile, and Government point to point.	Do.
18,100–56,000	16.6–5.35		Experimental	
56,000–64,000	5.35–4.69		Amateur	
64,000–400,000	4.69–0.7496		Experimental	
400,000–401,000	0.7496–0.7477		Amateur	

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[1] Ice patrol, broadcast, etc.

NOTES

1. Government service is the exchange of official Government business, for which Government stations shall use the bands assigned as "Government," or those marked "Nonexclusive." For regular service of other types Government stations shall use the band appropriate to the type of service to be performed. In case of a station performing both Government and other service, the frequency selected should be in the band assigned to the class of service which predominates, and occasional messages in the other class of service may be sent without shifting frequency. An exception to the foregoing allocation shall be permitted in connection with Government mobile radio equipment for training purposes. For such training and operation uses on frequencies between 550 and 1,500 kilocycles (wave lengths between 545 and 200 meters) the following rule will apply: The officer in charge of military or naval radio operations will confer with the Department of Commerce supervisor of radio in the locality where interference is probable to determine the frequencies which may be used with the least interference. Naval and military operations will then be confined so far as is possible to the time periods, frequencies, and powers which will cause minimum interference in the locality. It is understood that military and naval operation in this band will, in general, be limited to an antenna radiation of 75 meteramperes, to daylight hours, and to a limited number of hours per week and weeks per year. The amount of operation will differ somewhat in different parts of the country.

2. For the purposes of this report the following definitions shall apply:

Marine service is service between two stations, one of which is on board ship.

Point to point service is service between two stations, both of which are on land or on permanently moored vessels.

Coastal service is service between ship stations and stations on the coast.

Aircraft service is service between stations at least one of which is an aircraft.

Broadcasting service is transmission without designation of address for public reception.

Amateur service is service between licensed amateur radio operators.

Mobile service is service between stations at least one of which is movable (that is, ships, aircraft, trains, automobiles, etc.).

Public toll service is the exchange of public correspondence for tolls as opposed to limited, private, or special services, such as amateur, broadcasting, and beacon.

3. The higher border frequency of any band may be assigned to stations in the band, the lower border frequency being left for assignment to stations in the next lower band.

4. The band 165 to 190 kilocycles (1,817 to 1,578 meters) may be use for radio telephony for emergency service and for testing at hours and in locations which will not interfere with licensed CW and ICW services. This shall not be understood as requiring that existing spark stations be now discontinued.

DIGEST OF CHANGES FROM 1924 ALLOCATION

The changes in the 1925 report, as compared to the 1924 report, are as follows:

1. The arrangement of the tabulation was improved, a separate column being given for the type of transmission.

2. The 120 to 157 kilocycles (2,499 to 1,910 meters) marine exclusive band was changed to include aircraft, and was narrowed 4 kilocycles (50 meters).

3. The specific frequency of 125 kilocycles (2,399 meters) was assigned nonexclusively to Government work.

4. The 157 to 165 kilocycles (1,910 to 1,817 meters) point to point and marine band was widened by 4 kilocycles (50 meters) and opened to aircraft.

5. The Government nonexclusive wave of 160 kilocycles (1,874 meters) was changed to 155 kilocycles (1,934 meters).

6. The 165 to 190 kilocycles (1,817 to 1,578 meters) band is no longer open to spark point to point transmission.

7. The Government nonexclusive assignment of 185 kilocycles (1,621 meters) was canceled.

8. The 250 kilocycles (1,199 meters) frequency assigned nonexclusively to the Government was changed to 245 kilocycles (1,224 meters).

9. The 2,250 to 2,500 kilocycles (133 to 120 meters) aircraft exclusive band was changed to 2,250 to 2,300 kilocycles (133 to 130 meters).

10. The 2,500 to 2,750 kilocycles (120 to 109 meters) band assigned to mobile service was enlarged to extend from 2,300 to 2,750 kilocycles (130 to 109 meters) and opened to Government mobile use.

11. The 2,850 to 3,500 kilocycles (105 to 85.7 meters) band was assigned to public toll service, point to point service by electric power supply utilities, point to point and multiple address message services by press organizations, and Government mobile service.

12. The 3,500 to 4,000 kilocycles (85.7 to 75.0 meters) band was opened to naval aircraft and naval vessels working aircraft.

13. The 4,000 to 4,500 kilocycles (75.0 to 66.6 meters) was increased by 25 kilocycles (0.3 meters) and opened to point to point service by the Government and by public utilities.

14. The relay broadcasting band immediately above 4,500 kilocycles (66.6 meters) was correspondingly narrowed by 25 kilocycles (0.3 meters), becoming 4,525 to 5,000 kilocycles (66.3 to 60.0 meters).

15. The 5,700 to 7,000 kilocycles (52.6 to 42.8 meters) band was opened to point to point services generally.

16. The 8,000 to 9,000 kilocycles (37.5 to 33.3 meters) band was widened by 50 kilocycles (0.2 meters) and opened to Government and public utility point to point services.

17. The relay broadcasting band 9,000 to 10,000 kilocycles (33.3 to 30.0 meters) was correspondingly narrowed by 50 kilocycles (0.2 meters).

18. The 11,400 to 14,000 kilocycles (26.3 to 21.4 meters) band was opened to mobile and Government point to point services.

19. The 16,000 to 18,000 kilocycles (18.7 to 16.7 meters) band was widened by 100 kilocycles (0.1 meter) and was opened to Government point to point service.

20. The 18,000 to 56,000 kilocycles (16.7 to 5.35 meters) band was changed from beam transmission to experimental work generally.

21. The band above 64,000 kilocycles (below 4.69 meters) was divided, as follows: 64,000 to 400,000 (4.69 to 0.7496 meters) experimental; 400,000 to 401,000 (0.7496 to 0.7477 meter) amateur.

22. The terms used in the allocation schedule were more closely defined.

COMMITTEE NO. 2: ADVERTISING AND PUBLICITY

1. The committee divided advertising or publicity into three classes: (1) Direct advertising, (2) mixed advertising, (3) indirect advertising.

2. It was the consensus of opinion that both direct and mixed advertising were objectionable to the listening public. In fact, indirect advertising could be made detrimental to the interests of both the public and the broadcasting station.

3. Advertising to achieve its best results must create the good will of those to whom it is addressed. Hence the first requisite in the successful operation of any broadcasting station in which the excellence of programs depends largely upon the support of the advertiser is the presentation of the material transmitted in such a manner that it may appeal to the majority of the listening public.

4. The following resolution has been unanimously adopted by this committee for the guidance of all broadcasting stations:

Whereas the excellence and public-service value of radio programs is increased by the support of those seeking appropriate publicity; and

Whereas the use of inappropriate publicity methods meets with the hearty disfavor of the listening public; and

Whereas this public disfavor is fatal to the purpose of those seeking publicity and good will, as well as detrimental to the interest of the broadcaster and all branches of the radio industry: Therefore be it

Resolved, That it is the sense of this conference that the best interests of the listening public, of the radio industry, and of the broadcaster are all served by that form of broadcasting which provides a meritorious program of entertainment and educational nature and which limits itself to the building of good will for the sponsor of the program, whether he be the owner of the station or a subscriber utilizing its facilities.

Resolved, That the conference deprecates the use of radio broadcasting for direct sales effort, and any form of special pleading for the broadcaster or his products, which forms are entirely appropriate when printed or through direct advertising mediums.

Resolved, That the conference concurs in the suggestion of the Secretary of Commerce that the problems of radio publicity should be solved by the industry itself, and not by Government compulsion or by legislation; and be it further

Resolved, That the conference urges upon all owners of radio broadcasting stations the importance of safeguarding their programs against the intrusion of that publicity which is objectionable to the listener, and consequently detrimental to others in the industry, as well as to the reputation of the individual broadcasting station.

COMMITTEE NO. 3: LICENSES AND CLASSIFICATION

1. The committee after four extended sessions in regard to the problems assigned to it for consideration covering classification of stations, permit in advance of construction, listening for distress signals, license fees, duration of license, classification of operators at certain stations, and the necessity of knowledge of the code on the part of such operators, has to report as follows:

CLASSIFICATION OF STATIONS

2. Exhaustive discussion by your committee and others attending the meeting was given to discontinuing the distinction between classes A and B as applied to broadcasting stations. Consideration was given to the fact that the present distinction between classes A and B is purely artificial, based originally on the proposition that class B stations could not broadcast phonograph music. This result has been accomplished; that so far as the distinction was based on power that distinction has broken down, as we have many class A stations on 500 watts in addition to the B stations on 500 watts. In this respect the distinction necessarily has been disregarded; that the class A wave lengths are as good as the class B, and in some instances better. It seems objectionable to place these fine wave lengths in a class which implies inferiority. Your committee recommends that the Department of Commerce discontinue the terminology A and B as applied to classification, and allow the present classification, based on power, wave length assignments, and the requirements of the Department of Commerce to stand.

PERMIT IN ADVANCE OF CONSTRUCTION

3. In view of the very considerable expense attached to the construction of broadcasting and commercial land stations and the difficulty of securing wave lengths for such stations, your committee considered the desirability of requiring in advance permits by the Secretary of Commerce for the construction of such new stations in order that the owner thereof might have assurance that when his station was completed he may be able to operate it, and also place in the Secretary of Commerce authority to limit the number of new stations which may be erected. After full consideration of the subject your committee recommends that an application for a permit shall be required and approved by the Secretary of Commerce in advance of the construction of commercial land and broadcasting stations.

LISTENING FOR DISTRESS SIGNALS

4. While recognizing the necessity of safeguarding to the utmost the receipt of distress calls from marine stations, your committee gave consideration to the fact that certain stations can not interfere with the receipt of such calls, and therefore recommends that those

radio stations which by reason of location, power, and frequency can not, in the opinion of the Secretary of Commerce, cause interference with ship SOS calls, be relieved of listening in for such distress signals and shall also be relieved of the requirements of regularly licensed station operators, and that a special class of license for such operators be substituted therefor.

LICENSE FEES

5. If permits to build are granted in advance, licenses issued for long terms, and the number of stations restricted the owner secures a right similar in value to a franchise for which a fee should be paid. Your committee therefore recommends that fees be charged for the licensing of all broadcasting and commercial land telegraph and telephone stations, the range of such fees to be from a minimum of $25 to a maximum of $5,000 per annum.

DURATION OF LICENSE

6. The owner of a station having paid a substantial fee for his license, your committee considers that he should be protected under proper restrictions in the enjoyment of the use of such station for a reasonable period, and therefore recommends that the duration of the license of broadcasting and commercial land telegraph and telephone station shall be for five years, with the understanding that at the expiration of such license preferential consideration shall be given to the renewal thereof.

CLASSIFICATION OF LICENSES OF OPERATORS AND NECESSITY OF KNOWLEDGE OF CODE

7. Your committee has recommended that specified radio stations be relieved of the requirements of listening in for distress signals, inasmuch as they can not interfere with the receipt of such signals, and as the operators of such stations are not required to use the code it is recommended that a special class of license for operators of such stations be granted by the Secretary of Commerce, the requirements for these licenses not to include ability to send or receive telegraphic code but to be based on general radio knowledge as specifically applied to the radio station operated and to the interference which could be created by that station.

COMMITTEE NO. 4: OPERATING REGULATIONS

POWER

1. The committee gave careful consideration to the question of power in connection with its use by broadcasting stations, and after considerable discussion it was decided that, in the absence of more information as to the effect of increased power, the power limitations recommended by the Third National Radio Conference should remain in effect. The subject was concluded by the adoption of the following resolution:

Resolved, That it is the sense of this conference that there be no change in the regulations of the department recommended by the Third Radio Conference with regard to power limitation.

TIME DIVISION

2. The question of time division was given careful consideration. It was pointed out that, in view of the fact that there are many stations operating on two and three way time divisions and others operating on exclusive frequencies, there should be some equitable plan established dealing with this important matter. After considerable discussion for and against time division the committee agreed that, in the interest of the public service, there are now too many broadcasting stations on the air, and that the public would be better served if there were a less number of stations. Further time division was not approved. The committee adopted the following resolution:

Resolved, That it is the opinion of this conference that further division of time among stations is not in the interest of public service, and that the Department of Commerce should decline to grant any more licenses until the present number of broadcasting stations shall have been substantially reduced.

DUPLICATION OF FREQUENCIES

3. Consideration was given to the questions of power, separation between stations, sensitivity of receivers, and the difference between physical distance and that which constitutes electrical distance. After considerable discussion for and against the practice of duplicating frequencies the committee submitted the following resolution:

Resolved, That it is the sense of this conference that duplication of frequencies in the present broadcast band should not be permitted in the case of stations of greater than 500 watts, and that in the case of stations of 500 watts or lower duplication should be permitted where stations are separated by a sufficient electrical distance to avoid beat notes or interference in the territory covered.

REBROADCASTING

4. The term " rebroadcasting " was considered as referring to the interception by a broadcasting station of the program transmitted by another station and rebroadcasting the program transmitted from the originating station. It was pointed out that the program feature will ultimately become the most expensive part of a broadcasting

station, and that it would be unjust for any station to intercept and rebroadcast programs from originating stations without permission.

The subject of the inability to faithfully rebroadcast the program intercepted from the originating station was also discussed. The committee agreed that the practice of rebroadcasting programs should not be permitted except by and with the consent of the originating station. The following resolution bearing on the subject of rebroadcasting was adopted:

Resolved, That this conference recommends that rebroadcasting of programs should be prohibited except with the permission of the originating station.

REMOVAL FROM CONGESTED CENTERS

5. Careful consideration was given to the matter of the removal of broadcasting stations from congested centers. It was pointed out that a broadcasting station utilizing considerable power could very satisfactorily operate in large cities, particularly where the broadcasting station is located in the business section and outside of the residential section. On the other hand, a broadcasting station utilizing low power might become a source of great interference to listeners if the station were located in a city and in a residential section.

It was pointed out that the present tendency is to remove stations from congested areas and to remotely control their operation. This character of control has in the past worked out very efficiently, and it is a practice which is being extended throughout the country.

The committee felt that it was a matter that the Deparment of Commerce could best control through its licensing policy, and that stations should be licensed in localities only where interference would not be caused with the service of other stations. It was specifically pointed out that the public interest was the predominating consideration in the premises and should serve as the basis for the broadcasting privilege. The following resolution was adopted dealing with this important question:

Resolved, That it be the sense of this conference that, with a view to minimizing interference to large groups of listeners, the Department of Commerce shall, in licensing all broadcasting stations, use discrimination looking toward the locating of such stations outside of congested centers.

(NOTE.—The committee believes that renewal licenses should be considered as new licenses, and that the above resolution applies to the renewal of existing station licenses.)

LIMIT ON NUMBER OF STATIONS

6. The committee considered the question, Is it essential to limit the number of broadcasting stations in order to prevent further congestion?

The committee was unanimous in their views that the number of broadcasting stations should be limited, as there was ample evidence already at hand to show that serious congestion was taking place due to the large number of stations not having sufficient frequency separation or repeating frequencies to prevent interference. The committee felt that this was so much in evidence that little time need be spent on the question. They concluded the discussion by adopting the following resolution:

Resolved, That it is the sense of this conference that the bands of frequencies now assigned to broadcasting is overcrowded, causing serious interference. Therefore, the committee recommends, in the interest of public service, that no new stations be licensed until through discontinuance the number of stations is reduced and until it shall be in the interest of public service to add new stations.

BASIS FOR BROADCASTING PRIVILEGE

7. The committee considered the question, If stations are to be limited in number, should the public interest as represented by service to the listeners be the basis for the broadcasting privilege?

The committee were unanimous in the opinion that, in the interest of public service, it was necessary to limit the number of broadcasting stations, and accordingly adopted the following resolution:

Resolved, That it is the view of this conference that public interest as represented by service to the listener shall be the basis for the broadcasting privilege.

REGIONAL COMMITTEES

8. The committee gave very careful consideration to the question of the establishment of regional committees, and after considerable discussion it was the general consensus of opinion that it would be a very difficult task to set up the necessary machinery for inaugurating such a plan. It was further pointed out that radio broadcasting by its very nature constitutes a service that is national and international in scope, and that from a national point of view difficulty might be encountered due to issues being raised of a political character.

The committee in concluding its deliberations adopted the following resolution:

Resolved, That it is the sense of this committee that, in view of the national and international character of radio broadcasting, the establishment and enforcement of suitable regulations to govern the erection and operation of broadcasting stations are matters which come under the jurisdiction of the Department of Commerce, and therefore this committee recommends against the creation of regional committees. This committee offers no objection to the Department of Commerce following such procedure as, in its judgment, may seem desirable to secure the opinion of the public in the area served by a broadcasting station regarding the subject which it may be required to determine.

(This resolution was referred to Committee No. 8, on legislation, without action by the conference.)

SALE OF STATIONS

9. The committee discussed the action which should be taken with regard to licensed inactive stations that are being held for the express purpose of future sale, the sale including not only the transmitting station but the wave length which has been assigned the station for use by the original owner. The committee gave careful consideration to the question of sale of wave length by station owners and adopted the following resolution:

Resolved, That this conference views with considerable apprehension and disfavor any practice contemplating the sale of a wave length, and that we earnestly recommend that all future propositions of this kind be scrutinized most carefully by the Department of Commerce, so as to eliminate the possibility of speculating in wave lengths.

COMMITTEE NO. 5: MARINE PROBLEMS

1. The committee has given consideration both to the problems of marine communication which were assigned to it and to other problems within its jurisdiction which were presented to it by members of the conference and submits the following report and recommendations:

ARRANGEMENTS WITH FOREIGN COUNTRIES

2. The committee was informed of the arrangement recently concluded by the Department of State with Great Britain, Canada, and Newfoundland, by which vessels under the flags of these countries would not use frequencies of 1,000 kilocycles (300 meters) and 666 kilocycles (450 meters) within 250 miles of the coasts of the United States. The committee was further informed that the radio compass frequency of 375 kilocycles (800 meters) is used by vessels of Great Britain to the detriment of radio-compass service on the coasts of North America. The committee recommends:

That the conference express its commendation of the action taken by the Department of State and further recommends that the Department of State undertake to negotiate with these and other governments looking toward the prohibition of the use of frequencies between 1,500 to 550 kilocycles (200 to 545 meters) by vessels of such countries when within 250 miles of the coasts of the United States, and that the frequency band between 400 to 353 kilocycles (750 to 850 meters) be not used by any nation within 500 miles of a radio compass station of the United States except for compass work.

ASSIGNMENT OF FREQUENCIES TO COASTAL STATIONS

3. The assignment of frequencies to coastal stations was discussed at length, and the committee recommends that the Department of Commerce be requested to continue to follow the recommendations of the Third National Radio Conference in this respect, these recommendations having been found in actual practice to have worked satisfactorily. It is further the sense of this committee that the Department of Commerce, in assigning frequencies for coastal stations, should make efforts to select frequencies for such stations other than the frequencies assigned to ship stations.

ADDITIONAL CHANNELS FOR MARINE SERVICE

4. The question of congestion in the marine band was considered, as was the desirability of providing additional channels if this could be done without undue interference. The committee accordingly recommends that the Department of Commerce authorize the use of the frequency of 343 kilocycles (875 meters) by ship stations on CW, ICW, and spark; and that where local conditions will

permit, as adjudged by the Department of Commerce, an additional frequency of 454 kilocycles (660 meters) by CW, ICW, and spark be authorized.

RADIOTELEPHONY FOR HARBOR CRAFT

5. The desirability of operating systems of harbor craft by radiotelephone from a control station on shore was brought to the attention of the committee. It was pointed out that the present regulations which require a licensed operator to be on board such craft rendered the practical use of such system prohibitive for economic reasons. Request was made for the amelioration of the present license regulations. The committee is of the opinion that this is fundamentally a question of the nature of the license required but considers it a meritorious maritime radio problem, and accordingly gave notice to Committee No. 3 that it recommends that while the operator of the control station on shore should be licensed, as under the present regulations, the operation of radiotelephone apparatus on harbor craft which are controlled by a central radiotelephone station on shore does not necessitate the knowledge of code or a high degree of technical skill, and that a suitable license should be considered for such operators. This recommendation applies only to harbor craft using low power and frequencies between 2,750 and 2,500 kilocycles (109 to 120 meters).

HOURS OF WATCH

6. The question of the necessity of publishing the hours during which vessels voluntarily equipped with radio apparatus maintain watch was discussed. The committee recommends that the hours during which watch is observed by American radio-equipped vessels be obtained and published to the radio world by the Department of Commerce.

POSITION REPORTS

7. The question of TR (position) reports was taken up. The attention of the committee was invited to the fact that the recommendations of Subcommittee No. 4 of the Third National Radio Conference with respect to time of transmission of TR (position) reports were not being observed by all radio interests. The committee recommends that the Department of Commerce request all interested parties to confine the transmission of TR (position) reports to hours other than from 7 to 11 p. m. local shore station time except in case of emergency or in cases where such reports can be handled wholly by CW or ICW. The committee reiterates the recommendation of the Third National Radio Conference that, in order to minimize interference, the transmission of TR (position) reports be reduced to the minimum compatible with the actual requirements of service.

DECREMENT

8. The question of decrement of marine communication transmitters was considered, and it was the sense of the committee that gratifying progress had been made since the last conference in the trend toward

the adoption of transmitting equipment of less broad emission. The committee recommends that the users of radio transmitters be encouraged to continue the installation of transmitters of less broad emission, and that the decrement be so reduced that mobile installations have a decrement not exceeding 0.12, and that coastal installations have a decrement not exceeding 0.08.

LEGISLATION

9. The question of legislation with respect to marine radio service was discussed and it is the sense of the committee that there are no problems in the marine radio field that require legislative action at this time. The committee recommends that a resolution be adopted by the conference recommending against legislation which would affect marine radio service except insofar as such legislation may be considered necessary by the Secretary of Commerce to enable him to allocate whatever frequencies he deems advisable for the maintenance of adequate marine communication service.

SPARK EQUIPMENT

10. A discussion concerning the use of spark equipment for marine service was held, and the committee noted the following statement submitted by the representative of the American Steamship Owners Association:

> American shipowners are voluntarily replacing spark equipment with equipment having less broad emission. Considerable progress has been made in this replacement during the year, and indications are that all new equipment ordered by steamship companies will be of the latter type.

RADIO COMPASS AND RADIO BEACON SERVICES

11. The committee, recognizing the necessity for having guard bands for the radio compass and radio beacon services, reaffirms the recommendation of Subcommittee No. 4 of the Third National Radio Conference, as follows:

300 kc. (1,000 m.)	For radiobeacon, with a guard band of 125 meters below (to 343 kc.) against broad emissions and nonsimple harmonically modulated CW and of 52 meters above 1,000 meters (to 285 kc.). An exception of the 952-meter wave length assigned to Government use was approved. Where CW and simple harmonically modulated CW are employed, the 1,000-meter wave should be guarded by a frequency separation of 15 kc.
375 kc. (800 m.)	For radiocompass, with a guard band of 70 meters below (to 411 kc.) and of 70 meters above (to 345 kc.) 800 meters against broad emissions and nonsimple harmonically modulated CW. Where CW and simple harmonically modulated CW are employed, the 800-meter wave should be guarded by a frequency separation of 15 kc.

COMMITTEE NO. 6: AMATEUR PROBLEMS

1. The committee has made a careful study of matters affecting amateur operation. Committee No. 1, on allocations, has assigned for amateur uses the same frequency bands as were assigned a year ago. Amateur operation during the past year under existing regulations has been generally satisfactory, and in our consideration at this conference we have endeavored to depart as little as possible from existing regulations, in order that the administrative burden upon the supervisors of radio might be minimized. We therefore recommend to you that existing amateur regulations be continued in force, with the following minor modifications:

(*a*) That the conference recommend to the Department of Commerce that it no longer license the use of spark transmitters on amateur bands.

(*b*) That amateur phone operation be permitted in the amateur band between 3,500 and 3,600 kilocycles (85.7 to 83.3 meters), provided such stations observe the prescribed amateur silent hours.

(*c*) That, to fill a need that has been felt for years, a monthly supplement to the List of Amateur Radio Stations of the United States be published by the Department of Commerce, listing additions, changes, and deletions, and available on annual subscription.

2. In conclusion, the amateur committee directs attention to the fact that for many years past the Department of Commerce has not had sufficient funds properly to administer the radio laws and regulations, and it recommends to this conference that it go on record as urging the Congress at its next session to provide sufficient appropriations to the Department of Commerce for the proper control and encouragement of radio.

COMMITTEE NO. 7: INTERFERENCE

1. The committee has given consideration to the subjects referred to it by the conference, together with other suggestions by members of the committee itself, and submits the following report:

2. The committee feels that the excellent presentation submitted by a similar committee, as appearing in the report of the Third National Radio Conference, pages 22 to 29, admirably outlined the subject, and this committee has availed itself of that report and has endeavored to use it as a basis, with the attempt to add to it such items as the experience of the last year has brought forth. This committee had referred to it by the conference the following four subjects to be considered in detail: I, Radiating receiving sets; II, Maintenance of assigned frequencies; III, Harmonics; and IV, Nonradio electrical interference.

In addition to the above four subjects, the following subjects were considered: V, Spark transmitting sets; VI, Arc transmitting sets; VII, Use of unnecessarily high power and careless testing; VIII, High-power broadcasting stations; IX, Ship radio; and X, Methods of operation.

RADIATING RECEIVING SETS

3. One form of interference to broadcast reception is that which may be caused by certain types of receiving apparatus. The elimination of this interference naturally falls into two classifications, namely: (*a*) Remedies to be applied to receivers of the radiating type that are already in operation; (*b*) The prevention of interference from receivers which may in the future be placed in operation.

4. (*a*) The elimination of interference from radiating receivers already in use should preferably take the form of persuasion rather than coercion. It is felt that one of the most effective means of eliminating such interference is to give publicity to methods of operating receivers in such a manner that they will not radiate. Some publicity of this kind has been given during the past year, but it is felt that if the desired results are to be accomplished, the matter must be presented even more emphatically than has been done in the past. Testimony was received in the committee that an instruction pamphlet on Interference from Radiating Receiving Sets has been distributed in Canada, by the Canadian Government, to the owners of all registered receiving stations, with marked success and improvement in receiving conditions. In view of the fact that a large proportion of all the interference reported in the various radio districts has been due, in the past, to radiating receivers, it is believed that the dissemination of information upon this matter is of the greatest public importance, and that the attention of the press and of the periodicals of the country relating to radio should be especially called to it.

The success of the efforts which the public press has already made in disseminating information on radio broadcasting has been so great that it is believed their efforts continued in the direction will largely aid in suppressing this interference problem.

5. The committee also believes that the press might stimulate the organization of broadcast listeners to assist each district supervisor, thereby forming a clearing house for the local elimination of sources of interference.

6. (*b*) In conformity with the keynote of this conference, that the interest and welfare of the broadcast listeners are paramount, and in view of the fact that radiating receivers are potential sources of interference, this committee urgently recommends that at some definite and reasonable future date, the manufacture and sale of all radiating receivers for broadcast reception be discontinued. Because of the benefits which will accrue to the radio public from the suppression of radiating receivers, it is urgently recommended that if the manufacture and sale of such receivers be not discontinued within a reasonable period, legislation to that end shall be sought.

A radiating receiver is defined as a receiving device which generates oscillations of frequency within broadcasting limits in the receiving antenna so as to produce radiation therefrom of an intensity sufficient to cause noticeable interference in other receiving sets of average sensitivity.

(The adoption of this paragraph by the conference was with the understanding that it should not apply to every possible radiation, but that its interpretation should be a matter of degree.)

MAINTENANCE OF ASSIGNED FREQUENCIES

7. Frequency allocations have been made on the basis of narrow margins between adjacent stations, and this calls for maintenance of frequency within the closest possible limits. A better check on the use of unauthorized frequencies is being provided. Regular measurements and reports should be made of the frequencies actually used by radio transmitting stations throughout the United States. Work of this character is a proper duty of the Department of Commerce radio service. If, however, the Department of Commerce is unable to undertake more extended work of this kind at the present time, it is urged that arrangements be made by organizations operating radio stations, by which a systematic check may be obtained on the frequencies used by their radio transmitting stations. Such self-regulation has been carried on by several organizations, and it is believed that its extension, especially by organizations of broadcasting stations, is desirable.

8. Apparatus is now available for maintaining and checking the frequency of transmitting stations. It is recommended that the Department of Commerce require all stations to use some means of frequently checking their transmitted frequencies with a properly calibrated instrument. If this is done, it is believed that a separation of 10 kilocycles between broadcasting stations will not result in interference.

HARMONICS

9. Interference from harmonics results from the emission of radio power on one or more frequencies higher than the fundamental frequency. Any transmitting set is subject to this faulty tendency. By the use of simple and relatively inexpensive modern methods this objectionable transmission can be overcome. In spite of the fact that recommendation to this effect was made in last year's report (p. 26), very little attention has been paid to it in practice.

10. It is recommended that all offending transmitting stations emitting harmonics shall be compelled to install suitable means to suppress harmonic radiation.

NONRADIO ELECTRICAL INTERFERENCE

11. The solution of this portion of the radio interference problem insofar as the solution seems to be possible at this time apparently involves such subjects as the education of a portion of the public in all parts of the United States, and the cooperation with companies and individuals who render electric supply and communication services. In other words, it is a matter for self-service and helpful cooperation on the part of the public.

12. Such interference may occur at any point where electrical circuits are used. The most powerful high-voltage line and the least powerful household electrical appliance may produce such interference. Even a disconnected wire such as a guy wire, if irregularly grounded, as, for example, through the moving branches of a tree, may under the atmospheric conditions which exist in some parts of the country, cause sufficient interference to prevent the reception of weak radio broadcasts in that vicinity.

13. As these interferences do occur in every community, their sources can not possibly be found by the necessarily limited number of Government employees. As only a portion of the sources are caused by the lines that belong to companies which supply any kind of electric service and as the broadcast listeners in a limited area are frequently the only persons who are conscious of the existence of an interference, the most effective step to eliminate such interferences is to educate broadcast listeners in methods of locating the source of interference and its prevention or to take the necessary cooperative steps to have the interference eliminated.

14. This education of, and action by, the listening public can be brought about, as has been found experimentally, through the formation of local broadcast listeners' clubs, which have been guided by information from those who have made a special study of the subject. The information can be given to the clubs through the columns of the radio magazines, radio sections of newspapers, radio broadcast stations, and the publications of the Bureau of Standards, the publications and meetings of the National Electric Light Association, the American Institute of Electrical Engineers, the Institute of Radio Engineers, the American Radio Relay League, and by our educational institutions. This information, together with maintained interest and a persistent friendly spirit of cooperation with public-service companies and all other interested parties, can give excellent results.

15. The establishment of automobile clubs is said to have been a fundamental cause of our good roads. The establishment and maintenance of systematically and conservatively conducted radio clubs in all communities should serve as a fundamental factor for solving this and other radio problems that have to do with the giving of the best possible radio service to the public. For example, the results obtained through the clubs in which observations have already been made show that, through the club papers, talks and interference committees, such interferences were stopped. Also through demonstrations at club meetings, uninformed users of interfering radio receivers were shown how they produced interference which they then stopped. Also the clubs indicated that they could be careful, deliberating and reliable bodies, suitable for making recommendations to the Secretary of Commerce via the district radio supervisors on matters pertaining to the good of the service.

16. In addition, it is recommended that each district be supplied with sufficient personnel and an automobile equipped with apparatus suitable for finding interferences and making measurements necessary to good radio broadcast service.

17. From the standpoint of overriding interferences, the increase of power at broadcasting stations should help to solve the radio interference problem.

18. This committee desires to commend the work that has been done by the National Electric Light Association in disseminating information to the electric light companies regarding the finding and eliminating of accidental interferences that come from their lines. Also this committee desires to commend the other technical societies and the publications which have given out information on this subject. All of that information has served to reduce the number of interferences.

SPARK TRANSMITTING SETS

19. The interference resulting from the use of damped wave transmitters is gradually being reduced by the improvement of equipment, but is still rather serious in isolated cases. If the number of damped wave transmitting sets can be gradually reduced and the remaining sets of this class gradually improved in the quality of their transmission, the situation will be still further improved with little hardship to the owners of such stations. The following recommendations are submitted:

(*a*) That land stations in point-to-point service, other than those using CW, shall be limited to the use of waves of low equivalent decrement such as are produced by ICW installations.

(*b*) That mobile installations shall have decrements not exceeding 0.12 and that coastal installations shall have decrements not exceeding 0.08.

ARC TRANSMITTING SETS

20. Arc transmitters shall be so equipped and so operated as to eliminate parasitic and spacing wave radiation. (See page 25 of report of third conference.)

USE OF UNNECESSARILY HIGH POWER AND CARELESS TESTING

21. Unquestionably much interference now experienced is the result of using higher transmitting power than necessary. There is a noticeable tendency to provide sufficient power to maintain communication under unfavorable conditions and then to continue with that power through all the more favorable seasons. Control of power input necessarily rests usually with the operating personnel, and few operators will voluntarily reduce power for the possible accommodation of remote stations not in a position to make their troubles known directly. In fact, the use of sufficient power to get every signal through clearly without necessity for repetition is probably more conducive to reduction of interference than the use of less power which results in repetitions, and thereby consumes more time than necessary in clearing traffic. The happy medium between maximum power and insufficient power can only be achieved by constant supervision of operations by the responsible management assisted so far as possible by the Government inspectors. It is a very difficult situation to control by Government inspectors alone, and the burden must be assumed primarily by the managements of stations. Consideration should also be given to the operating speed of operators in order to reduce interference resulting from the unnecessary repetition of messages in transmission.

22. Interference from careless testing is similar to that from the use of excessive power in that it is usually under the direct control of an operator without due appreciation or respect for the rights of others. Much testing can be conducted without radiating energy, and if testing with radiation could be confined to the actually necessary cases the interference from the source would probably be negligible, particularly if testing were conducted on the authorized frequency of the station. Care on the part of responsible managements that their operators are properly instructed in testing methods, combined with vigilance and report to supervisors on the part of all cognizant of such abuses, are about the only remedies which can be suggested.

HIGH-POWER BROADCASTING STATIONS

23. The fear which was felt a year ago that high power would adversely affect the reception of a large number of listeners has been shown to be without foundation. The increase of power by transmitting stations has improved general conditions of reception. It is recommended that the present attitude of the Department of Commerce of authorizing experimental development of high-power broadcasting stations be continued. It is also recommended that all future stations which radiate frequencies within the broadcasting band be located away from congested centers of population, the distance depending on the field strength produced in the congested area.

SHIP RADIO

24. It is recommended that the Department of Commerce endeavor to secure the enactment of legislation which will permit the establishment of uniform regulations regarding the use of radio transmit-

ters by ships in ports and territorial waters, and the conclusion of international agreements covering the use of radio by ships in the vicinity of the Unted States.

25. The recommendation of the Third National Radio Conference that 500 kilocycles (600 meters) be reserved for calling and distress only has materially reduced interference. This could be carried still further through adoption of uniform methods of operation so that this frequency is used as little as possible in establishing communication without reducing the number of marine stations which habitually listen on this frequency.

MISCELLANEOUS

26. In view of the great congestion which exists at the present time within the limits of broadcasting frequencies, it is urgently recommended that the Secretary of Commerce withhold further licenses within these limits, pending congressional legislation to this end.

27. The committee renews the appeal contained in last year's report (page 29) calling attention to the urgent necessity for providing increased personnel and equipment for the Department of Commerce, in carrying out the numerous and arduous duties pertaining to the regulation of radio in the United States.

COMMITTEE NO. 8: LEGISLATION

1. It has been the pride of the radio industry that it has been to a large extent self-regulating, most of the regulatory features necessary for its efficient functioning being discussed and agreed upon at these annual conferences rather than imposed by governmental authority. It is highly desirable that this condition shall continue to the greatest measure possible. Nevertheless, it must be recognized that in the widespread network of stations that now exist throughout the country, each a potential destroyer of the messages of the other, regulation to keep open the traffic lanes is absolutely essential, and that regulation can be imposed efficiently only by the central authority of the Federal Government, which must have the right through issue of licenses, control of power, assignment of wave lengths, and other appropriate measures, to handle as a whole the interstate and international situation. This power should be vested in the Secretary of Commerce, as it is to a limited degree at present. But governmental authority should not be extended to mere matters of station management, not affecting service or creating interference, nor should it under any circumstances enter the forbidden field of censorship.

2. That authority should exist to limit the number of stations in any community has already been determined by this conference, which has likewise recommended that benefit to the listener must be the basis for the broadcasting privilege. With these determinations your committee is of course in hearty accord. We would, however, point out that recognition of the principle of public benefit does not bring the broadcasting stations into the category of recognized public utilities. The owners of broadcasting stations have not dedicated them to public use in a legal sense, and such matters as regulation of rates and other similar features of supervision exercised by governmental bodies over public utilities generally, should still, in the judgment of your committee, remain under the exclusive control of the station owner. In many respects these provisions are inapplicable to broadcasting stations by their very nature; and, in any event, we do not believe the time has come for their imposition.

3. As to the specific matters referred to this committee, we respectfully submit the following report:

4. It is the opinion of this committee that—

(*a*) Existing Federal statutes are inadequate to permit proper administration of radio communication activities.

(*b*) The Congress of the United States is empowered by the Constitution to enact legislation necessary to provide such adequate administration.

(*c*) Present conditions and the public interest require that such legislation be enacted.

5. Your committee therefore recommends that Congress do enact such legislation, incorporating therein the following principles:

(*a*) That the administration of radio legislation shall be vested in the Secretary of Commerce, who shall make and enforce rules and regulations necessary to the proper administration of the provisions of such legislation.

(*b*) Such administration shall be exercised by the Secretary through the officers or employees of the Department of Commerce.

(*c*) That the doctrine of free speech be held inviolate.

(*d*) That those engaged in radio broadcasting shall not be required to devote their property to public use and their properties are therefore not public utilities in fact or in law; provided, however, that a license or a permit to engage in radio communication shall be issued only to those who in the opinion of the Secretary of Commerce will render a benefit to the public; or are necessary in the public interest; or are contributing to the development of the art.

(*e*) That in time of war or other national emergency the President shall have the power to discontinue or commandeer existing stations, with just compensation.

(*f*) That no monopoly in radio communication shall be permitted.

(*g*) That the legislation shall contain provisions for due appeal from final decisions of the Secretary of Commerce to the appropriate court.

(*h*) Except in the case of governmental stations, the Secretary shall be empowered to classify all stations and to fix and assign call letters, wave length, power, location, time of operation, character of emission, and duration of license.

6. It is recommended that call letters shall be recognized as representing a property right and be treated accordingly during the life of the license. The Secretary shall not change call letters, wave length, power, time of operation, nor character of emission except on the application by or consent of the licensee; provided, however, that if in the opinion of the Secretary such changes are required as a public necessity any change or changes may be made.

7. Provided further, that the term of a license to operate a broadcasting transmitting station, the character of which is to be defined in the act, shall be not to exceed five years, with the privilege of renewal for like periods, and provided further, that the Secretary may suspend or revoke any license for failure to maintain regular operation of a transmitting station without just cause.

(*i*) No license shall be issued to operate a transmitting station not already operating in radio communication, except mobile or amateur stations, unless prior to the application for such license there shall have been issued by the Secretary of Commerce an erection permit; provided further, that an erection permit to engage in radio communication shall be issued only to those who, in the opinion of the Secretary of Commerce, will render a benefit to the public; or are necessary to the public interest; or are contributing to the development of the art.

(*j*) Each license to operate a transmitting station in radio communication shall prescribe the responsibility of such station with respect to distress signals, but in any event all licenses shall provide that upon due and proper order from governmental authority such stations shall cease operation until released by the same authority.

(*k*) That the act should define the following terms, to wit: Commercial stations, broadcasting stations, amateur stations, and experimental stations.

(*l*) That the Secretary shall have the power to revoke or suspend any license whenever he shall determine that the licensee has violated any of the terms of his license, regulation of the Secretary, Federal radio law, or international treaty.

(*m*) That in order to insure financial stability to radio enterprises, capital now invested must receive reasonable protection; therefore all stations which contribute to the public interest and benefit shall be given a reasonable length of time to conform to the provisions of the proposed act and the rules and regulations prescribed thereunder.

(*n*) That rebroadcasting of programs shall be prohibited except with the permission of the originating station.

(*o*) The Secretary of Commerce shall be empowered to make and enforce such rules and regulations as may be necessary to prevent interference to radio reception emanating from radio sources.

(*p*) Authority should be provided to prescribe and enforce uniform regulations regarding the use of radio transmitters on ships in territorial waters.

COMMITTEE NO. 9: COPYRIGHT RELATIONS TO BROADCASTING

In organizing this committee Secretary Hoover stated that the matter is one with which the Department of Commerce is not directly concerned. It is a question of copyright rather than radio. While it did not fall within the strict scope of the conference, in response to numerous requests Committee No. 9, on copyright relations to broadcasting, was appointed. Since the question primarily concerned broadcasters, the committee membership included a group of persons named by the president of the National Association of Broadcasters.

1. Representatives of the American Society of Composers, Authors, and Publishers discussed with the committee some of the copyright questions involved in broadcasting.

2. It was agreed by all interests that the owners of copyrights were entitled to reasonable compensation for the use of their copyrights, and the representatives of the broadcasting interests indicated a complete willingness to pay a reasonable charge for copyrighted numbers used by them.

3. It appeared, however, that the parties were not able to agree upon the terms and conditions of use of copyrights. The committee reached the conclusion that no good purpose would be served by undertaking to make a recommendation upon these disputed matters. The committee, however, considered the principles which should control in the solution of this problem, and its conclusions are embodied in the resolution presented to the conference, a copy of which is shown below.

4. Attention is directed to the fact that this resolution is applicable in terms only to musical compositions. The committee did not undertake either in its deliberations or its recommendations to deal with copyrights of literary or dramatic production nor of press matter.

RESOLUTION ADOPTED BY COMMITTEE NO. 9

(No action was taken by the conference on this report. It was allowed to stand as the recommendation of the committee.)

Whereas there can be no continuation of broadcasting unless musical compositions are made available to broadcasters upon a fair, equitable, and permanent basis; and

Whereas an insistent demand from the public requires that music be made the principal part of broadcast entertainment; and

Whereas practically all of this music is held by copyright proprietors and is not available to broadcasters except on prohibitive and unstable terms; and

Whereas the broadcasters recognize the right of the copyright proprietors to compensation for the use of their compositions and are willing to pay a fair and equitable maximum fee for each broadcast rendition of each copyright musical number; and

Whereas broadcasters believe that copyright owners should have the sole, complete, and entire right to withhold their property from all broadcasting if they so desire; but that if a copyrighted number is released by the owner thereof to one or more broadcasters, then such number shall become available to all broadcasters; and

Whereas the present conditions threaten the entire broadcasting structure and the continuation and permanence of broadcasting depends upon the solution of this problem; and

Whereas all attempted solutions through negotiation between the parties have proved unavailing: Now, therefore, be it

Resolved, That it is the sense of this conference that the only possible solution lies in the enactment of suitable legislation based upon the above principles, and it is the recommendation of this conference to the Secretary of Commerce that such legislation be suggested to Congress.

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INSTITUTE FOR GOVERNMENT RESEARCH

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OF THE
UNITED STATES GOVERNMENT
No. 65

Selections from

THE FEDERAL RADIO COMMISSION

ITS HISTORY, ACTIVITIES AND ORGANIZATION

BY
LAURENCE F. SCHMECKEBIER

THE BROOKINGS INSTITUTION
WASHINGTON
1932

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THE FEDERAL RADIO COMMISSION

ITS HISTORY, ACTIVITIES, AND ORGANIZATION

CHAPTER I

HISTORY

The Federal Radio Commission is an independent establishment of the national government dealing with the licensing of radio stations of every character, the licensing including the assignment of frequencies, the fixing of power to be used in transmission, and the determination of hours of operation.

Early Use of Radio, 1896 to 1921. As early as 1842 Professor S. F. B. Morse, the inventor of the telegraph, had succeeded in transmitting intelligible signals for short distances without the use of wires.[1] During the last half of the nineteenth century various investigators gradually developed some of the principles affecting the production and detection of electro-magnetic waves, but it was not until 1896 that Guglielmo Marconi made a successful demonstration of wireless transmission of signals and applied for the first British patents for circuits and apparatus.[2]

Within a few years after Marconi's first demonstration wireless equipment had been installed on a number of vessels, and shore stations had been established.

The first recognition of wireless telegraph in the laws of the United States was the passage of the Wireless Ship Act of June 24, 1910 (36 Stat. L., 629), effective July 1, 1911. This act was directed solely to better protection of life at sea, and required wireless equipment on every passenger vessel carrying fifty or more persons, including passengers and crew. The limitations of wireless transmission at that time are reflected in the provisions of the act, which required apparatus capable of transmitting or receiving messages over a distance of at least one hundred miles.

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[1] Bucher, E. E., A résumé of early radio development, in The Radio Industry, the story of its development, 1928, p. 21.

[2] *Ibid.*, p. 28.

Power to make regulations for the execution of the act was conferred on the Secretary of Commerce and Labor, who assigned the enforcement duties to the Bureau of Navigation, which has charge of the enrollment and licensing of vessels. The Radio Service of the Bureau of Navigation was set up on July 1, 1911, and the Secretary of Commerce and Labor (after March 4, 1913, the Secretary of Commerce) exercised through that organization all powers in regard to radio until the creation of the Federal Radio Commission in 1927, except that during the war with Germany radio communication was largely under the control of the military and naval authorities.

The act of 1910 was amended by the act of July 23, 1912 (37 Stat. L., 199), which contained additional provisions governing radio on merchant ships.

An additional act to regulate radio communication was approved on August 13, 1912 (37 Stat. L., 302), and was the only basis for government regulation of radio until the passage of the act of February 23, 1927 (44 Stat. L., 1162), creating the Federal Radio Commission. The two earlier acts were concerned solely with the installation of radio apparatus on merchant ships, but the act of August 23, 1912, regulated interstate communication by radio. As practically all radio signals extend beyond state boundaries, the effect of the act was to give unified control of transmission.

The main provisions of the act of August 23, 1912, were as follows:

Every station must be licensed
Every operator must be licensed
The frequencies must be more than 500 kilocycles or less than 187.5 kilocycles[3]

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[3] In the early laws, regulations, and general usage radio signals were classified by the wave-length or distance between the crests of the sound waves emitted by the transmitter. At present signals are generally classified by the frequency, expressed in kilocycles, of the

Private stations (amateurs) not engaged in commercial business must not use a frequency of less than 1500 kilocycles.

The administration of the act was placed in the hands of the Secretary of Commerce and Labor (Secretary of Commerce after March 4, 1913), but a peculiar feature which had far-reaching consequences was the fact that all the regulations were embodied in the act, no power to make regulations being conferred on the Secretary.

The first specific recognition of broadcasting was a departmental ruling of December 1, 1921, which further defined the class of stations known as "limited commercial". A frequency of 833.3 kc. was authorized for broadcasting news, concerts, lectures, and such matter, and of 618.6 kc. for crop reports and weather forecasts, "provided the use of such wave-lengths does not interfere with ship to shore or ship to ship service".[4]

Up to 1921 the work of the Radio Service of the Department of Commerce was limited to the inspection of ships in order to secure compliance with the law, the licensing of ship and shore stations, and the examination and licensing of operators, both commercial and amateur. While the work required skill and technical knowledge there had not developed the perplexing questions which made radio a matter of intense public interest a little later.

Thus the work of the government was almost entirely a

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circuit used in transmission, the frequency being also the rate at which the wave vibrates per second. In this volume all the earlier references to wave-lengths have been changed to kilocycles.

The relation between wave-length and frequency is constant, as wave-length in meters multiplied by frequency in kilocycles equals 300,000. Therefore, if either wave-length or frequency is known, the other factor may be obtained by dividing the known factor into 300,000. The constant factor 300,000 is used because the speed of the signal emitted is 300,000 kilometers (300,000,000 meters) per second.

For instance, in order to travel 300,000,000 meters in a second a wave 1000 meters in length must vibrate 300,000 times, which is its frequency. As each vibration represents one cycle, a wave 1000 meters in length has a frequency of 300,000 cycles or 300 kilocycles.

[4] *Radio Service Bulletin*, January 3, 1922, p. 10.

matter of ordinary routine, although the increase in the merchant marine taxed the facilities of the service. The public as a rule knew little about radio and cared less. At times it would be thrilled by a rescue at sea made possible by the use of radio, but ordinarily it gave no thought to the subject. Radio was just another means of communication, supplementing the post office, the telephone, and the telegraph. With the exception of a few thousand amateur operators who communicated with one another by wireless telegraph, the radio did not enter into the life of the mass of the people.

Development of Broadcasting, 1921–26. In the latter part of 1921 conditions were suddenly changed. For some time experiments had been made with broadcasting, and on November 2, 1920, the first broadcast was made by Station KDKA of the Westinghouse Electric Company of Pittsburgh.[5] Apparently no special license was required at that time, as the first broadcasting license was not issued until September, 1921.[6] The number of broadcasting stations had grown to sixty by March 1, 1922, and to 564 by November of that year.[7] On February 27, 1922, Secretary of Commerce Hoover stated that the "department estimates that today over 600,000 (one estimate being 1,000,000) persons possess wireless telephone receiving sets, whereas there were less than 50,000 such sets a year ago".[8]

The executive branch of the government was quick to see what would result from unrestricted use of radio, and in February, 1922, the Secretary of Commerce called the First Conference of representatives of all branches of the radio industry. This Conference recommended complete government control, the allocation of frequencies to different classes of service (the frequencies 606.1–618.5 being recommended for all broadcasting stations), the assignment by the Secretary of Commerce to each broadcasting station of a power range of 250 miles, and that the same frequency should not be assigned to stations within 750 miles of one another. The infancy of the industry is shown by the fact that in 1922 the expert representatives of important stations did not protest against a maximum range of 250 miles.

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[5] Davis, H. P., Early history of broadcasting, in The Radio Industry, the story of its development, 1928, p. 197.

[6] Secretary of Commerce, Annual Report, 1923, p. 221.

[7] House Hearings on Commerce and Labor appropriation bill, 1924, p. 118.

[8] *New York Times*, February 28, 1922.

A bill designed to carry into effect the conclusions of the Conference was introduced in Congress, but conditions were not bad enough to stir the legislators to action, and there was no legislation until 1927.

The first attempt at the classification of broadcasting stations was made in an amendment of August 8, 1922, to the departmental rules. Previously all broadcasting had been on frequencies of 618.6 and 833.3 kc. That amendment established a new group known as class B, to operate on a frequency of 750 kc. The requirements specified included a minimum power of 500 watts, a maximum power of 1000 watts, careful supervision of programs, the use of mechanically operated musical instruments only in an emergency, and the division of time if there were two or more stations in the same locality. The amendment specifically provided that any failure to maintain standards would result in the cancelation of the license and the transfer to the group using the 833.3 kc. frequency.[9]

A bill specifically providing for licensing by the Department of Commerce, was introduced in the House of Representatives on January 11, 1923. It was favorably reported on January 16,[10] and passed the House on January 31. No action was taken in the Senate other than reference to the committee.

In February, 1923, the Court of Appeals of the District of Columbia administered the first blow to the existing system of control by ruling that a mandamus would lie to compel the Secretary of Commerce to issue a license for a wireless station, that the action of the Secretary was purely ministerial, and that he had no discretion. The Court, however, distinctly stated that the assignment of a wave-length was entirely under the control of the Secretary.[11]

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[9] *Radio Service Bulletin*, September 1, 1922, p. 10.

[10] 67 Cong., H. rep. 1415 (on H. R. 13777).

The Second Conference on radio problems met in March, 1923, and Secretary Hoover summed up the situation in the following words:

> When this committee met a year ago there were 60 broadcasting stations in the United States; today there are 588. It was estimated then that there were between 600,000 and 1,000,000 receiving sets, today it is believed there are between 1,500,000 and 2,500,000 persons listening.
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> Public broadcasting has practically been limited to two wave-lengths, and I need not dilate to you on the amount of interference there is and the jeopardy in which the whole development of the act stands.[12]

At this time only three frequencies were available for broadcasting—618.6, 750, and 833.3 kc. The Conference found that "a new field extending from 222 to 545 meters [550.9 to 1351.4 kc.] can be created for the purpose. Within this field stations can be assigned individual wave-lengths."[13] This recommendation was the initial step in the differentiation which has been adopted.

It was the unanimous opinion of the Conference that the Secretary under existing law had authority "to regulate hours and wave-lengths of operation of stations and to revoke or withhold licenses of stations when such action is necessary to prevent interference detrimental to the public good".[14]

The recommendations of the Second Conference promptly received the approval of the Secretary of Commerce, and a new classification of stations was announced on April 4, 1923, to be effective on May 15. Stations were divided into three classes and the main features of the classification were as follows:[15]

Class A stations included those having a power not exceeding 500 watts These were assigned a wave-length between

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[11] Hoover v. Intercity Radio, 286 Fed. 1003.

[12] *New York Times*, March 21, 1923.

[13] *Ibid.*, March 25, 1923.

[14] *Ibid.*

[15] *Radio Service Bulletin*, May 1, 1923, p. 11.

222 and 300 meters (1000 and 1351.4 kc.). Division of time was required if necessary.

Class B stations were required to have a power of not less than 500 watts and not more than 1000 watts. Wave-lengths between 300 and 345 meters (869.5 and 1000 kc.) and between 375 and 545 meters (550.9 and 800 kc.) were to be available for these stations. In addition to technical requirements the regulations provided for supervision of programs by the station in order to insure satisfactory service. The use of mechanically operated musical instruments was prohibited, and provision was made for division of time, if deemed necessary.

Class C stations included all those licensed at that time to use 360 meters (833.3 kc.), which was continued as the wave-length for the new class. Stations then using 360 meters could be transferred to class B if they could qualify or to class A.

The United States was divided into five zones, with separate wave-lengths designated for certain localities in each zone.

The Third National Radio Conference met in October, 1924, and the situation at that time was summarized by the Secretary of Commerce as follows:

> One of the most important subjects for your consideration is the rearrangement of our system so as to provide more operating channels for broadcasting stations—more wave-lengths. This is the first step to eliminate more of the interference. As you know, our previous conferences have classified our broadcasting stations, have zoned the country in effort to secure these results. The wave-lengths of the stations in the same zone were placed at least 50 kilocycles apart, adjoining zones at least 20 kilocycles apart, and distant zones at least 10 kilocycles apart. This was a great step and has been in a large degree successful, but many new difficulties have arisen. Of the present 530 stations 57 are class B, with a power of from 500 to 1000 watts and have a wide range, and 387 are class A, many using small power and covering small areas. There are still 86 class C stations, most of which have low power, all on a wave-length of 360 meters [833.3 kc.]. Our chief trouble is with the class B situation. They are all assigned within the band of 288 to 545 meters [550.9 to 1388.8 kc.], within which

there are, under the present system of allocation and excluding the class C band, only 44 available wave bands and only 33 that seem desirable at present. To assign these among the 57 stations necessarily means duplication, although it was the theory of the last conference that individual wave-lengths could be assigned to each. As it now develops, only 23 stations either have exclusive wave-lengths or are sharing with stations so distant that both may operate simultaneously, while the remaining 34 are compelled to divide time, and the congestion is growing in the large cities, New York and Chicago particularly. A recent survey made by the supervisors of radio of the various districts shows that 21 new class B stations are now under construction and that 25 others are contemplated, so that the question of allocation is one of increasing difficulty. In the light of scientific and technical development in both transmitting apparatus and receiving sets during the year I believe that some changes in zoning or in station separation may now be installed, thus creating additional wave-lengths for assignment. It has been suggested, also, that the band now reserved for class B might be somewhat broadened. Removals of class C stations from the class B band and their distribution into individual wave-lengths would likewise give some relief, depending on what proportion of the present class C stations qualify for class B licenses. Another constant source of interference are the radio code signals which lie in the broadcasting band. This is the result of the old international agreements before radio broadcasting was discovered.[16]

The scope of the subjects considered by the Conference is illustrated by the committees appointed, which were as follows:

General allocation of frequency or wave-length bands
Allocation of frequency or wave-length bands to broadcasting stations
General problems of radio broadcasting
Problems of marine communication
Amateur problems
Interference problems
Interconnection
Coördination.

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[16] Department of Commerce, Recommendations for regulation of radio, adopted by the Third National Radio Conference, October 6–10, 1924, p. 5.

Each committee, except the one on coördination, made a detailed report which was adopted by the Conference.

In the meantime hearings had been held by the House Committee on Merchant Marine and Fisheries, and legislation had been proposed. On April 7, 1924, the Senate passed a bill[17] reaffirming the right of the United States to control the use of the ether, but conferring no powers on any government agency. This bill was reported to the House on May 13, 1924, in materially different form. The House amendment provided in detail for regulation, with the licensing power in the hands of the Secretary of Commerce. The bill went on the calendar, but was never considered in the House, and on January 23, 1925, on the motion of the chairman of the Committee on Merchant Marine and Fisheries, it was recommitted to that committee. The bill was not again reported by the Committee and the statutory term of the Sixty-eighth Congress ended on March 4, 1925, without any legislation.

In November, 1925, the Fourth National Radio Conference convened in Washington, and the developments within the year were summed up by Secretary Hoover as follows:

> The most profound change during the year, however, has been the tremendous increase in power and the rapid multiplication of powerful stations. When the conference assembled a year ago, there were 115 stations equipped to use 500 watts or more. Now we have 197 such stations, an increase during the year of over 70 per cent. This mere numerical expansion of stations falls far short of telling the whole story. A year ago only two stations were equipped to use an excess of 500 watts. Of the new stations 32 are equipped to use 1,000 watts, 25 to use 5,000 watts, and 2 a still higher power, making 59 in all against 2 last year. Taking the situation as a whole, we find that a year ago all stations of 500 watts and over were using a total of 67,500 watts. To-day they use 236,500 watts, or a 250 per cent increase.
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> A year ago we were fearful of the effect of greater power. We were told by some that the use of anything more than 1,000 watts would mean excessive blanketing, the blotting out of smaller competitors, the creation of large areas into which no other signals could enter. Some of the most pessimistic even warned us that our tubes would explode under

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[17] 68 Cong., S. 2930.

the impact of this tremendous force. But our experience so far leads to the opinion that high power is not only harmless in these respects but advantageous. Power increase has meant a general rise in broadcasting efficiency; it has meant clearer reception; it has helped greatly to overcome static and other difficulties inherent in summer broadcasting, so as to give us improved all-year service. Whatever the limit may be, I believe that substantial power increase has come to stay, and the public is the gainer from it.[18]

The Fourth Conference, like its predecessor, considered the details by means of committees, which were as follows:

General allocation of frequency or wave-length bands
Advertising and publicity
Licensing and classification
Operating regulations
Marine problems
Amateur problems
Interference
Legislation
Copyright relations to broadcasting

Each committee made a report which was adopted by the Conference; that on legislation containing the following recommendations:

(a) That the administration of radio legislation shall be vested in the Secretary of Commerce, who shall make and enforce rules and regulations necessary to the proper administration of the provisions of such legislation.

(b) Such administration shall be exercised by the Secretary through the officers or employees of the Department of Commerce.

(c) That the doctrine of free speech be held inviolate.

(d) That those engaged in radio broadcasting shall not be required to devote their property to public use and their properties are therefore not public utilities in fact or in law; provided, however, that a license or a permit to engage in radio communication shall be issued only to those who in the opinion of the Secretary of Commerce will render a benefit to the public; or are necessary in the public interest; or are contributing to the development of the art.

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[18] Fourth National Radio Conference, Proceedings, and recommendations for regulation of radio, November 9–11, 1925, p. 3.

(e) That in time of war or other national emergency the President shall have the power to discontinue or commandeer existing stations, with just compensation.

(f) That no monopoly in radio communication shall be permitted.

(g) That the legislation shall contain provisions for due appeal from final decisions of the Secretary of Commerce to the appropriate court.

(h) Except in the case of governmental stations, the Secretary shall be empowered to classify all stations and to fix and assign call letters, wave-length, power, location, time of operation, character of emission, and duration of license.

* * * *

(i) No license shall be issued to operate a transmitting station not already operating in radio communication, except mobile or amateur stations, unless prior to the application for such license there shall have been issued by the Secretary of Commerce an erection permit; provided further, that an erection permit to engage in radio communication shall be issued only to those who, in the opinion of the Secretary of Commerce, will render a benefit to the public; or are necessary to the public interest; or are contributing to the development of the art.

(j) Each license to operate a transmitting station in radio communication shall prescribe the responsibility of such station with respect to distress signals, but in any event all licenses shall provide that upon due and proper order from governmental authority such stations shall cease operation until released by the same authority.

(k) That the act should define the following terms, to wit: Commercial stations, broadcasting stations, amateur stations, and experimental stations.

(l) That the Secretary shall have the power to revoke or suspend any license whenever he shall determine that the licensee has violated any of the terms of his license, regulation of the Secretary, Federal radio law, or international treaty.

(m) That in order to insure financial stability to radio enterprises, capital now invested must receive reasonable protection; therefore all stations which contribute to the public interest and benefit shall be given a reasonable length of time to conform to the provisions of the proposed act and the rules and regulations prescribed thereunder.

(n) That rebroadcasting of programs shall be prohibited except with the permission of the originating station.

(o) The Secretary of Commerce shall be empowered to make and enforce such rules and regulations as may be necessary to prevent interference to radio reception emanating from radio sources.

(p) Authority should be provided to prescribe and enforce uniform regulations regarding the use of radio transmitters on ships in territorial waters.[19]

Breakdown of Federal Regulation, 1926. The regulatory power of the Secretary of Commerce received its deathblow by a decision of the United States Court for the Northern District of Illinois rendered on April 16, 1926, in the case of United States v. Zenith Radio Corporation. The station of that corporation had a license for a specified wave-length and limited time. It ignored the limitations set forth in the license and an information was filed against it. The facts were not disputed.

The Court held that there was "no express grant of power in the act [of 1912] to the Secretary of Commerce to establish regulations," and that the "Secretary of Commerce is required to issue the license subject to the regulations in the act. The Congress has withheld from him the power to prescribe additional regulations." [20]

The regulations contained in the act of 1912 provided that the wave-length of a station of this character should be between certain limits. The effect of the decision in the Zenith case was, therefore, to allow a station to use any wave-length within the limits specified in that act. As the Court of Appeals of the District of Columbia had previously held that the Secretary had no power to refuse to issue a license, the granting of licenses by the Secretary became a perfunctory matter.

As the Court of Appeals of the District of Columbia had ruled that the Secretary had discretion in assigning a wave-length, and the District Court for the Northern District of Illinois held that he had no such power, there was an apparent conflict between the rulings of the two courts.

The question was submitted to the Attorney General on June 4, and the Acting Attorney General on July 8, rendered an opinion which in substance was as follows: [21]

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[19] *Ibid.*, pp. 35–36.

[20] United States v. Zenith Radio Corporation, 12 Fed. (2d), 616, 617.

[21] 35 Op. Att. Gen. 126–32.

1. A license is required to operate a broadcasting station
2. The Secretary is required to issue a license on request[22]
3. The operation of a broadcasting station without a license is an offense under the act of 1912
4. There is no doubt that radio communication is a proper subject for Federal regulation under the commerce clause of the Constitution.
5. The Secretary of Commerce has no power to specify wave-lengths[23]
6. The Secretary of Commerce has no power to assign hours of operation, except that he may designate stations which must refrain from operating during the first 15 minutes of each hour—a period specified in the act of 1912 to be reserved if necessary in designated localities for Government stations.
7. The Secretary has no authority to limit the power to be used
8. The Secretary has no power to issue licenses of limited duration[24]
9. A licensed station may use wave lengths at will, provided it does not trespass upon the band from 600 to 1600 meters (187.5 to 500 kc.) specified in the act.

This opinion effectually removed all vestiges of power remaining in the hands of the Secretary, and the issuance of licenses became a perfunctory matter. The situation was summed up by the Acting Attorney General in the final paragraph of his opinion as follows:[25]

[22] The Court of Appeals of the District of Columbia had already (1923) held that the Secretary had no discretion regarding the issuance of a license. See page 5.

[23] The rulings of the two courts regarding the power of the Secretary to assign wave-lengths were reconciled as follows: "However, in my opinion, these remarks of the Court of Appeals [regarding power to assign wave-lengths] are to be construed as applying only to the *normal* sending and receiving wave-length which every station is required to designate under the first regulation [of the act of 1912]. But under the second regulation [of the act of 1912], any station is at liberty to use 'other wave-lengths' at will, provided only that they do not trespass upon the band from 600 to 1600 meters [187.5 to 500 kc.]. This conclusion appears to be in accord with the opinion of the District Court for the Northern District of Illinois in case . . . of United States v. Zenith Radio Corporation."

[24] On account of the rapid development the Secretary had been issuing licenses for ninety days only.

[25] 35 Op. Att. Gen. 132.

It is apparent from the answers contained in this opinion that the present legislation is inadequate to cover the art of broadcasting, which has been almost entirely developed since the passage of the 1912 Act. If the present situation requires control, I can only suggest that it be sought in new legislation, carefully adapted to meet the needs of both the present and the future.

Radio Act of 1927. In the meantime Congress had been giving consideration to the problem of control of radio, but action was delayed by reason of the coupling of regulation of transmission and the suppression of alleged monopoly in apparatus resulting from the pooling of patents. Several bills had been introduced in the Senate, but as the House bills were the only ones reported by the committees they alone will be considered. In December, 1925, Representative White of Maine introduced a bill on which hearings were held by the Committee on Merchant Marine and Fisheries. As a result of the committee hearings a bill was introduced and this was reported to the House on February 27, 1926.[26] This bill contained a section dealing with monopoly control of apparatus.

On March 3, 1926, a new bill (H. R. 9971) was introduced, and on March 5, was favorably reported by the committee.[27] This bill, from which the monopoly control was eliminated, was the one on which action was taken. Both reports were accompanied by lengthy and vigorous minority views by one member of the committee.

H. R. 9971 passed the House on March 15, 1926. A similar bill (S. 1754) had been introduced in the Senate, and the Senate Committee on Interstate Commerce had held extended hearings. The Senate amended the House bill by striking out all after the enacting clause, and inserting its own bill. The bill passed the Senate and was sent to conference on July 2.

Both bills provided for a Federal Radio Commission, the essential differences between the two being over the powers to be granted to the Secretary of Commerce and to the

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[26] 69 Cong., H. rept. 404 (on H. R. 9108).

[27] 69 Cong., H. rept. 464.

Commission. The House bill placed original licensing authority in the Secretary of Commerce, who might refer any matter to the Commission, to which any person affected by the action of the Secretary might appeal. The Senate bill placed the original licensing authority in the Commission. Both bills agreed in placing administrative authority in the hands of the Secretary of Commerce. The licensing authority included the fixing of wave-lengths, power, and time of operation. The administrative authority included the inspection of land and ship stations, the licensing of operators, and the assignment of call letters.

As Congress was about to adjourn, and it was evident that the conferees could not agree, a joint resolution (S. J. Res. 125) was passed by both houses on July 3, in order to retain some control over broadcasting. Unfortunately this resolution was passed so late in the session that it could not be presented to the President for signature before the adjournment of Congress. Consequently it was not approved until December 8, after the convening of the next session (44 Stat. L., 917).

The resolution provided that no license should be granted for a period of more than ninety days for a broadcasting station and for more than two years for any other type of station. It also provided that no license or renewal should be granted unless the applicant would execute a waiver of any right, as against the United States, to any wave-length or to the use of the ether in radio transmission.

The second session of the Sixty-ninth Congress convened on December 6, 1926, and the conferees reached an agreement on January 27,[28] but the two houses did not finally ratify the action of the conferees for several weeks. The bill was approved by the President on February 23, 1927 (44 Stat. L., 1162).

This act created a Federal Radio Commission, which for a period of one year was to be the original licensing authority; after the expiration of one year the Secretary of Commerce was to succeed to the licensing authority, and the Commission was to become an appellate body.[29]

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[28] 69 Cong., H. rept. 1886; S. doc. 200.

For the purpose of the act the United States was divided into five zones as follows:

First zone, Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Delaware, Maryland, the District of Columbia, Porto Rico, and the Virgin Islands.

Second zone, Pennsylvania, Virginia, West Virginia, Ohio, Michigan, and Kentucky.

Third zone, North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Mississippi, Arkansas, Louisiana, Texas, and Oklahoma.

Fourth zone, Indiana, Illinois, Wisconsin, Minnesota, North Dakota, South Dakota, Iowa, Nebraska, Kansas, and Missouri.

Fifth zone, Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Hawaii, and Alaska.

The Commission consisted of five members, appointed by the President, by and with the advice and consent of the Senate. One Commissioner was appointed from each zone, in which he must be an actual resident. Not more than three Commissioners were to belong to the same political party. No member was to be financially interested in the manufacture or sale of radio apparatus, or in the operation of a wireless station of any kind. The President was authorized to designate one member as chairman, with the proviso that "chairmen thereafter elected shall be chosen by the Commission itself". The act was silent as to when the "chairmen thereafter elected" should be chosen.

The first Commissioners were to be appointed for terms of two, three, four, five, and six years, the term of each to be designated by the President. The successors to the first Commissioners were to be appointed for terms of six years, except that a person chosen to fill a vacancy was to be appointed for the unexpired term. These provisions staggered the expiration of the terms of office.

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[29] The licensing power of the Commission was extended to March 16, 1929 (45 Stat. L., 373), then to December 31, 1929 (45 Stat. L., 1559), and finally it was made of indefinite duration (46 Stat. L., 50).

The Commissioners were to receive a compensation of $10,000 a year during the first year; thereafter when the Commission became an appellate body they were to receive thirty dollars a day while engaged in work of the Commission.

The act specifically stated that it was intended to regulate all forms of interstate and foreign radio transmissions and communications within the United States including vessels and aircraft.

While radio transmission was not declared to be a public utility, the act specifically stated that the rulings of the Commission should be based on "public convenience, interest, or necessity".

The powers specifically conferred on the Commission were as follows:

To classify stations
To prescribe the nature of service to be rendered
To assign frequencies or wave-length to stations or classes of stations, to determine power to be used and to allocate time of operation
To determine the location of classes of stations or individual stations
To regulate the apparatus to be used with reference to its external effects and the purity and sharpness of emissions
To make regulations to prevent interference
To establish zones to be served by any station
To make special regulations applicable to chain broadcasting.

An effort was made to secure equal service in all parts of the country by the provision that the licensing authority should make "such a distribution of licenses, bands of frequency of wave-lengths, periods of time for operation, and of power among the different states and communities as to give fair, efficient, and equitable radio service to each of the same."

The monopoly of broadcasting in political campaigns is prevented by the requirement that if one candidate is allowed to use a station all other candidates for the same office are to have similar opportunities. However, a broadcasting station is not required to extend its facilities to candidates for office. The act specifically provides that a station shall not exercise any censorship over material broadcast by candidates for office.

Censorship by the Commission is forbidden, and it is specifically provided that no regulation shall interfere with the right of free speech. These immunities do not extend to "obscene, indecent, or profane language", which is specifically forbidden.

The duration of a license for a broadcasting station was limited to three years and for other stations for five years. It was specifically provided that no license should be granted until the applicant had "signed a waiver of any claim to the use of any particular frequency or wave-length or of the ether against the regulatory power of the United States because of the previous use of the same, whether by license or otherwise. The constitutionality of this provision was before the Supreme Court of the United States in two cases, but the Court refused to rule on the ground that the questions were of objectionable generality, and the appellants failed to avail themselves of the right of appeal afforded by the Radio Act.[30]

Limitations on the issuance of licenses were as follows: No license for a broadcasting or commercial station was to be issued unless a permit for construction had been granted prior to the beginning of construction. Licenses and construction permits were to be refused to any person or corporation, or subsidiary of a corporation, which had been finally adjudged guilty by a Federal Court of unlawfully monopolizing or attempting unlawfully to monopolize, after the effective date of the act, "radio communication, directly or indirectly, through the control of the manufacture or sale of radio apparatus, through exclusive traffic arrangements, or by any other means or to have been using unfair methods of competition." So far no licenses have been refused under the monopoly provision, and it is a question whether it applies to a civil or a criminal judgment.

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[30] White v. Johnson; American Bond and Mortgage Co. et al. v. United States; 283 U. S., 367–75.

Licenses may be revoked by the Commission (1) For failure to operate in accordance with the terms of the license, (2) for violation of any provision of the act or of the regulations made thereunder, (3) or whenever the Interstate Commerce Commission or any other federal body having jurisdiction shall certify to the Commission that the licensee has failed to afford reasonable facilities, has made unjust or unreasonable charges, or is guilty of discriminations in services and charges. The revocation for the third cause is directed primarily against stations engaged in transmitting commercial messages from point to point.

The act specifically provides that all anti-trust laws shall be applicable to the manufacture and sale of and trade in radio apparatus and devices entering interstate commerce. This declaration is probably superfluous, as the anti-trust laws cover all commodities. The act further provides that if any licensee shall be found guilty, in either civil or criminal proceedings, of a violation of the anti-trust laws, the court may decree that the license shall be revoked.

Radio licensees are forbidden to acquire any interest in telegraph and telephone companies doing an interstate or foreign business if the purpose of such action is "to substantially lessen competition or restrain commerce". These provisions were directed against companies engaged in commercial point-to-point wireless transmission.

A check on the action of the Commission is provided by allowing an appeal to the Court of Appeals of the District of Columbia if the Commission refuses to issue a construction permit, a station license, or a modification of an existing license. Under the original act if a license was revoked the licensee could appeal to the Court of Appeals of the District of Columbia, or to the "district court of the United States [for the district] in which the apparatus licensed is operated". Under the amendatory act of July 1, 1930 (46 Stat. L., 844), all appeals in cases involving revocation are to the Court of Appeals of the District of Columbia. The act of July 1, 1930, also provides that appeals may be taken by a person adversely affected by any ruling.

Specific powers vested in the Secretary of Commerce are as follows:

- To prescribe the qualifications of station operators and to issue licenses to operators
- To suspend licenses of operators for violation of any law or treaty or of any regulation of the Commission or the Secretary
- To inspect all transmitting apparatus to determine whether it conforms to the law, the regulations, and the license
- To report to the Commission violations of the law, the regulations, or the provisions of the license
- To designate call letters
- To publish lists of call letters and other desirable information.

The Secretary may refer to the Commission at any time any matter the determination of which is vested in him by the act.

The powers of the Secretary listed above were in force immediately and ran without time limit. In addition, at the expiration of one year, the Secretary was to acquire certain powers exercised by the Commission during that period. As the licensing power of the Commission was extended twice for a limited period and then indefinitely—these powers were never acquired by the Secretary, and it is not necessary to discuss them.

Radio stations operated by the government are not subject to licensing by the Commission or inspection by the Secretary of Commerce; wave-lengths for these stations are assigned by the President. Government operators are not subject to license by the Secretary of Commerce. In time of war or national emergency the President is authorized to suspend the regulations, close stations, or take over their operation.

Other provisions of the act relate to requirements for ship stations, priority to distress signals, exchange of messages between ship and shore stations, time arrangement to prevent interference with government stations, confidential character of private messages, interception of messages, and sending false distress signals.

With the exception of one section the act was entirely a regulatory measure. Section 30 authorizes the Secretary of the Navy to use radio stations under the control of the Navy Department for the transmission of press messages of American newspapers between the United States and foreign countries and to transmit private commercial messages between Alaska and the continental United States.

This section was not in the House bill, but was added in the Senate although it is not mentioned in the Senate report. The conference report states that authority "to use Government stations for the transmission of press messages and commercial messages was given by a joint resolution approved June 5, 1920, as amended. The section which appears in this bill is the resolution of June 5, 1920, as amended with very slight change therein." Section 30 embodies only Section 2 of the resolution of June 5, 1920 (41 Stat. L., 1061). Section 1 of that resolution permitted the use of government radio stations for "Government business, compass reports and safety of ships". Section 2, as amended by the resolutions of April 14, 1922 (42 Stat. L., 1095), and February 28, 1925 (43 Stat. L., 1091), expired by limitation on June 30, 1927. Section 3 required that government stations should be operated in accordance with the wireless act of August 13, 1912.

The Radio Act of 1927 (44 Stat. L., 1162) repealed the joint resolution of June 5, 1920. Section 2 of that resolution, as amended, was superseded by Section 30 of the Radio Act of 1927. Section 3 of the resolution was superseded by Section 6; nothing in the Radio Act or any other act superseded Section 1.

The First Year's Work. The Radio Act of 1927 was approved on February 23, nine days before the day for the statutory expiration of the Sixty-ninth Congress. This fact had an important bearing on the development of the work of the Commission by reason of the short time left for confirmation and for providing funds for operation.

Nominations of the five Commissioners were sent to the Senate on March 1, and three were confirmed on March 4, no action being taken on the other two. Recess appointments were given to the unconfirmed appointees, but as the vacancies existed when the Senate was in session, no salary could be paid to the unconfirmed appointees.[31]

One of the confirmed Commissioners died on October 8, and another on November 24, 1927. The successor to the latter was not appointed until March 29, 1928, being confirmed on the following day. Therefore from November 24, 1927, to March 29, 1928, there were only four Commissioners, and of these only one had been confirmed by the Senate.

The fiscal situation was also unfortunate. It was not in order for Congress to consider formally an appropriation until the Commission had been created, but an estimate was promptly submitted on February 26.[32] On that day the deficiency appropriation bill passed the House, but an appropriation of $115,000 for the remainder of the fiscal year 1927 and for the fiscal year 1928 was recommended by the Senate Committee on Appropriations. The deficiency bill, however, failed of passage because of a filibuster on another subject, and no funds were appropriated for the work of the Commission.

Fortunately the Radio Act of 1927 provided that the unexpended balances of the appropriation made to the Department of Commerce under the item "wireless communication laws" should be available for expenditure by the Commission. Accordingly the Department of Commerce expended $28,313.86 for the remainder of the fiscal year ending June 30, 1927, and $42,512.82 for the portion of the fiscal year 1928 expiring on January 31, 1928. The first appropriation directly to the Commission was for $52,186 for the portion of the fiscal year 1928 between January 31 and June 30, carried in the deficiency act of December 22, 1927 (45 Stat. L., 5).

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[31] One of the unconfirmed Commissioners resigned October 31, 1927, before being confirmed; payment of salary was provided by a special joint resolution approved March 23, 1928 (45 Stat. L., 1712). The other appointee to the original Commission was not confirmed until March 30, 1928, and received no salary prior to that date (R. S., 1761).

[32] 69 Cong., H. doc. 761.

While the jurisdiction of the Commission extended over all kinds of wireless communication, the most pressing problem when it was created related to broadcasting. The broadcast band was practically limited to a range of from 550 to 1500 kilocycles, with the exception that the frequency of 1365 kilocycles was reserved for maritime mobile services. Both technical conditions and international agreement permitted the use of frequencies higher than 1500 for broadcasting, but the practical objection to such use was the fact that a large proportion of the receiving sets would not receive frequencies higher than 1500 kilocycles.

As it was desirable that there be a separation of ten kilocycles between the channels used, there remained ninety-six channels in the broadcast band. The reservation of six channels for Canadian stations under an informal agreement made previously by the Department of Commerce, left ninety channels available for transmission in the United States.

When the Commission assumed office 732 stations had been licensed. A satisfactory distribution of this number of stations over ninety channels could be accomplished only by division of time, allocation of the same frequency to several low power stations in different zones in order to prevent interference, or the closing of stations. As many of the stations represented a material capital investment, and as the more expensive stations were largely segregated in several cities, the ruthless closing of stations seemed to be out of the question.

The first formal meeting of the Commission was held on March 15, 1927. Its first order was to renew indefinitely all amateur and ship licenses. The second order was to call a general conference for March 29 to April 1. Both these orders were issued on March 15.[33]

The Radio Act of 1927 provided that all existing licenses should expire sixty days after its approval. This period ended on April 24. On March 29, an order was issued extending until further notice all licenses for coastal, point-to-point, technical training, and experimental services.[34] On April 15 the Commission announced that temporary permits would be issued to all broadcasting stations applying for the privilege prior to April 24.[35]

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[33] Federal Radio Commission, Annual Report, 1927, p. 12.

On April 17 the Commission took its initial action affecting specific broadcasting stations by ordering a change in the frequencies of 129 stations which had been operating on frequencies other than those previously authorized by the Department of Commerce.

The first general reallocation as regards frequencies, power, and time of operation was ordered on May 21, when all temporary permits were terminated effective June 1, and it was provided that all broadcasting stations should be operated in accordance with the provisions of new licenses specifying new frequencies, power, and time of operation. On May 28 the effective date of the new licenses was changed to June 15 in order to give the stations time to make the necessary adjustments.

There seemed to be a general inclination on the part of the broadcasters to give the new allocations a trial, as only fifteen stations made formal protest and applied for change in frequency or power. A hearing was held on each protest, and the Commission denied eleven applications, granted two in full, and granted two in part.[36] By July 1, the licensed stations numbered 698.[37]

It was manifest that no organization could solve the problem in three months, and the Commission recognized that additional changes would be necessary. Commenting on that reallocation of June 15, the Commission later said:

> . . . Radio-reception conditions were far from satisfactory as the result of the commission's reallocation of June 15, 1927. The reallocation had succeeded to a marked extent in reducing interference arising from congestion in the larger metropolitan centers, where the stations had been crowded together without adequate frequency separation; it had not, however, succeeded in remedying the heterodyne

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[34] *Ibid.*, p. 13.

[35] *Ibid.*

[36] The ruling in each case is given in the Annual Report of the Federal Radio Commission for 1927, p. 12.

[37] Federal Radio Commission, Annual Report, 1928, p. 8.

interference (resulting from two or more stations operating simultaneously on the same channel), which was ruining reception in rural areas, and indeed in all parts of the country. The complaints which deluged the commission immediately made it apparent that changes would have to be effected.[38]

During the latter half of 1927 the several Commissioners traveled in their respective zones to make first-hand studies of broadcasting problems, and as the result of these trips various changes were made. On November 14, 1927, the Commission issued General Order No. 19, which contemplated the clearing of all channels between 600 and 1000 kilocycles.[39] This general order was followed by a special order (No. 211) making new allocations of a number of stations.[40]

For some time there had been complaints from the South that it was not getting its share of broadcasting; this was undoubtedly true, as during the uncontrolled period before the creation of the Commission, the development of broadcasting had been slower in the South than in other sections. In its comment on General Order No. 19, the Commission took occasion to point out that the "South is particularly well represented in this picture of cleared channels, Atlanta, Ga. [1000 watts], Nashville, Tenn. [5000 watts], Louisville, Ky. [500 watts], as well as Fort Worth [5000 watts] and San Antonio, Tex. [5000 watts],[41] having been assigned cleared frequencies." [42]

The first appropriation for the Commission was carried in the deficiency appropriation act approved December 22, 1927 (45 Stat. L., 5). It amounted to $52,186 for the period from February 1 to June 30, 1928, arrangements having been made to have the expenses prior to February 1 paid from the appropriation made to the Department of Commerce.[43]

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[38] *Ibid.*

[39] *Ibid.*, p. 42.

[40] *Ibid.*, p. 71.

[41] Fort Worth and San Antonio divided time on the same frequency.

[42] Federal Radio Commission, Annual Report, 1928, p. 77.

[43] House Hearings on First Deficiency appropriation bill, 1928, p. 92.

Late in 1927 and during the early months of 1928, the technical staff and the Commission gave considerable attention to the high frequency bands (above 1500 kilocycles), which are used largely for commercial communications.

The Radio Act of 1927 provided that at the end of a year after the first meeting of the Commission the licensing authority should be transferred from the Commission to the Secretary of Commerce, and that the Commission should become an advisory and appellate body. This year expired on March 15, 1928.

As the end of the statutory period approached it became evident that the licensing authority would have to be continued in the Commission or that the Secretary of Commerce would have to assume a burden equal to that existing when the Radio Act was passed.

In its report on the bill continuing the licensing power in the Commission, the House Committee on Merchant Marine and Fisheries, after reciting the changes in the Commission and the fact that for several months only one member had been confirmed, summed up the situation as follows:

> In the judgment of your committee it has been inevitable that a commission so constituted should not have felt that sense of approval and that assurance of authority essential to a formulation of policies and to prompt any decisive action in furtherance thereof. To the embarrassments of uncertain tenure and shifting personnel there has been added the handicap of inadequate clerical and technical assistance and a flood of problems of great public importance arising from the developments in the art of radio during the year.
>
> The set-up in the broadcasting field which it was believed at the time the radio act was passed could be worked out in a year's time has not yet been effected. We are confronted with the dilemma of continuing the commission in authority for another year during which it is hoped the situation may be improved, or, of returning to the Secretary of Commerce the authority taken from him last March. Your committee is of the opinion that the knowledge and experience gained by the commission during the year now closing is worth availing ourselves of. We believe that the commission should be given further time in which to for-

mulate sound principles and to work out in accordance therewith a more efficient system of communication.[44]

In January, 1928, three bills [45] were introduced to meet the situation. The only bill that emerged from Committee was S. 2317, which was reported to the Senate on February 3, and passed by that body on February 6. The bill as reported from the Committee did not provide for a change in term of office of the Commissioners, but as amended in the Senate it legislated all the Commissioners out of office on February 23, 1929.

At this time the nominations of three members were pending in the Senate, and it was stated on the floor that there was "great doubt with regard to their confirmation, not by reason of anything particularly against them, but for reasons which appealed to us".[46] It was reported that many Senators were willing to vote for confirmation for two years but not for six.

The House did not agree with the proposal of the Senate to legislate the Commissioners out of office, although many members were dissatisfied with the results of the work, particularly in regard to the division of broadcasting facilities between the several zones. It was charged that discrimination had been exercised against the South and West, and that preference had been given to high-power stations in the North and East. Section 9 of the Radio Act of 1927 had contained the following provision for equalization of facilities:

> In considering applications for licenses and renewals of licenses, when and in so far as there is a demand for the same, the licensing authority shall make such a distribution of licenses, bands of frequency of wave-lengths, periods of time for operation, and of power among the different States and communities as to give fair, efficient, and equitable radio service to each of the same.

In order to make the provisions for allocation more definite the House Committee proposed to strike out the paragraph quoted above, and to insert a new paragraph as follows:

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[44] 70 Cong., H. rept. 800, p. 2.

[45] H. R. 8825, S. 2317, and S. 2853.

[46] Cong. Record, Vol. 69, Pt. 3, p. 2533.

> The licensing authority shall make an equal allocation to each of the five zones established in Section 2 of this act of broadcasting licenses, of wave-lengths, and station power; and within each zone shall make a fair and equitable allocation among the different states thereof in proportion to population and area.

The provision last quoted is generally known as the Davis Amendment, as it was drafted and proposed by Representative Ewin L. Davis, of Tennessee. After a prolonged debate it was adopted by the House by a vote of 235 to 135. The vote was largely a sectional division, the bulk of the opposition to the amendment coming from New York, New Jersey, Massachusetts, Pennsylvania, Michigan, and Illinois, which furnished eighty-eight of the 135 votes against it.

This amendment was amplified somewhat by the conferees, and as adopted in the act was as follows:

> It is hereby declared that the people of all the zones established by section 2 of this Act are entitled to equality of radio broadcasting service, both of transmission and of reception, and in order to provide said equality the licensing authority shall as nearly as possible make and maintain an equal allocation of broadcasting licenses, of bands of frequency or wave-lengths, of periods of time for operation, and of station power, to each of said zones when and in so far as there are applications therefor; and shall make a fair and equitable allocation of licenses, wave-lengths, time for operation, and station power to each of the States, the District of Columbia, the Territories and possessions of the United States within each zone, according to population. The licensing authority shall carry into effect the equality of broadcasting service hereinbefore directed, whenever necessary or proper, by granting or refusing licenses or renewals of licenses, by changing periods of time for operation, and by increasing or decreasing station power, when applications are made for licenses or renewals of licenses: *Provided*, That if and when there is a lack of applications from any zone for the proportionate share of licenses, wave-lengths, time of operation, or station power to which such zone is entitled, the licensing authority may issue licenses for the balance of the proportion not applied for from any zone, to applicants from other zones for a temporary period of ninety days each, and shall specifically designate that

said apportionment is only for said temporary period. Allocations shall be charged to the State, District, Territory, or possession wherein the studio of the station is located and not where the transmitter is located.

It should be noted that the amendment as adopted required that in the allocation the station should be charged to the state where the studio is located, and not where the transmitter is located. This was mainly to settle the allocation of stations having studios in New York with transmitting stations in New Jersey.

The act extending the licensing power of the Commission was approved March 28, 1928 (45 Stat. L., 373). In addition to the more stringent and definite rules for allocation contained in the Davis Amendment, cited above, the act continued the Commission as the licensing authority until March 16, 1929. A new provision was that prior to January 1, 1930, no license should be granted for a broadcasting station for a period of longer than three months or for any other class of station for more than one year. The original act of 1927 provided that licenses should not be issued to broadcasting stations for a period of longer than three years or to any other station for longer than five years. In view of the tentative character of many of its rulings the Commission had limited station licenses to sixty days for broadcasting stations and to one year for other classes of stations.[47]

An unusual feature of the act of March 28, 1928, was the provision legislating all the Commisioners out of office at the end of eleven months. The term of office of each member of the Commission was made to expire on February 23, 1929, and thereafter new appointments were to be made for terms of two, three, four, five, and six years. This meant that the Commissioners were to be on probation for a year, that their "uncertain tenure," cited by the House Committee as a cause of embarrassment,[48] would be continued, that their reappointment in office would depend on the amount of pressure that could be brought on the appointing power, and that they would have to give satisfaction to the confirming power.[49] The passage of the act with this limitation resulted in the confirmation of four Commissioners two days after the act was approved.

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[47] 70 Cong., S. rept. 227, p. 2.

[48] 70 Cong., H. rept. 800, p. 2.

The statutory authority of the Commission to license stations reverted to the Secretary of Commerce on March 15 before the bill was finally passed and approved. However, the Radio Act of 1927 provided that the Commission should have power to determine all matters brought before it during the year, and that thereafter the Secretary of Commerce might refer to the Commission any matter the determination of which was vested in him. Therefore, as the Commission had authority to dispose of pending cases and as the Secretary of Commerce ordered all applications to be referred to the Commission, the actual authority of the Commission during the interim period was the same as before, although on a somewhat different legal basis.

The Second Year. The initial work during the second year of the Commission was the reallocation of broadcasting stations in order to comply with the provisions of the Davis Amendment. There immediately developed difference of opinion among the members of the Commission regarding its interpretation.

> . . . A majority of the commission has construed the amendment as requiring an immediate reallocation of broadcasting facilities so as to attain the prescribed equality. Commissioner Robinson has construed the amendment as indicating a policy to be followed in the future by the commission in gradual steps without calling for any general rearrangement of stations immediately, and that the equalization was to be accomplished "when and in so far as there are applications." There has also been a difference of opinion as to whether the amendment, properly construed, requires an equality in number of licensed broadcasting stations by zone without regard to division of time or whether two or more stations dividing time in one zone may be balanced as against one station occupying full time in another zone.[50]

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[49] One Commissioner resigned effective January 31, 1929, and one effective February 23, 1929, the date the termination took effect; the three remaining Commissioners were reappointed.

[50] Federal Radio Commission, Annual Report, 1928, p. 12.

One of the first steps was an endeavor to reduce the number of stations. On May 25, 1928, the Commission issued General Order No. 32, addressed to 164 stations,[51] stating that it was not "satisfied that public interest, convenience or necessity" would be served by granting applications for renewal. Of the stations so notified, thirty-seven were in the first zone, thirty-one in the second zone, ninety-one in the fourth zone, and five in the fifth zone. There was none in the third zone, which included the Southern states.

Hearings on General Order No. 32 were begun July 9; representatives of 110 stations appeared before the Commission and fourteen stations submitted their cases in writing. Four stations voluntarily surrendered their licenses. Thirty-six stations made no immediate protest, but four [52] of these later asked to be heard and their cases were considered.

This order and the hearings resulted in the closing of twenty-six stations by order of the Commission, thirty-two by reason of default in appearance, and four by voluntary surrender of license.[53] In addition, forty-seven stations had voluntarily surrendered their licenses between March 15 and June 30. There was thus a total reduction of 109 stations out of approximately 700.

In the meantime there had been a conference with radio engineers and representatives of the trade and industry in order to work out allocations under the Davis Amendment. The principles governing the new allocations were embodied in General Order No. 40,[54] issued August 28, 1928; later the specific allocations were made to be effective November 11, 1928.[55]

The Commission comments on this plan as follows:[56]

> . . . It represented a combination of the plans which had been suggested to the commission from time to time, together with certain concessions which had to be made to the practical necessities of the situation because of the

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[51] *Ibid.*, pp. 45, 146–50.

[52] *Ibid.*, p. 15.

[53] *Ibid.*, p. 16.

[54] *Ibid.*, p. 48.

[55] *Ibid.*, pp. 171–214.

[56] *Ibid.*, p. 17.

existing number and character of the broadcasting stations. Forty channels were set apart for stations of sufficient power on cleared channels to give good service to rural and remote listeners. These channels were allocated equally, eight to each zone. This type of service corresponds to the type which was called "national" in the plans submitted to the commission by expert engineers in April. Thirty-five channels were set aside for stations of power not to exceed 1,000 watts, to be allocated equally among the zones, each channel to be used—with certain exceptions—by not less than two nor more than three stations. Six channels were set aside for use in all five zones by stations of 100 watts or more; five channels were set aside for use in all five zones by stations having not to exceed 1,000 watts; four channels were set aside for use by stations of 5 kilowatts in two or more zones. By a supplementary General Order No. 42 the power of stations on the 40 cleared channels was limited to 25 kilowatts, with provision for the use of 50 kilowatts during the next license period in order to determine what interference, if any, would result. Commissioner Robinson urged a limitation to 10 kilowatts.

The Radio Act of 1927 specifically provided that the Commission should have "authority to make special regulations applicable to radio stations engaged in chain broadcasting" (44 Stat. L., 1164). When the act was passed and later there seemed to be considerable opposition to chain broadcasting on the ground that it indicated monopoly, and because a listener close to two stations on a chain would get the same program from both stations.

On September 8, 1928, the Commission issued General Order No. 43,[57] which provided that two or more stations should not broadcast the same program between 7 p. m. and midnight unless (1) the transmitters were more than 300 miles apart, (2) the stations were operating on the same frequency,[58] or (3) special permission was granted by the Commission.

This order was to be effective November 11, 1928. On October 5, by General Order No. 46,[59] the effective date was changed to January 31, 1929. It was postponed by a series of later orders, and was finally rescinded on December 20, 1929 (General Order No. 83).[60]

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[57] *Ibid.*, p. 52.

[58] At that time synchronization of programs was not successful.

[59] Federal Radio Commission, Annual Report, 1928, p. 53.

Act of March 4, 1929. The first extension of the licensing authority of the Commission expired on March 15, 1929. The regulation of broadcasting was far from settled, and in addition the use of high frequencies for point to point and other strictly commercial uses was assuming increasing importance. There was therefore comparatively little opposition to extending its licensing authority.

The act of March 4, 1929 (45 Stat. L., 1559), extended the licensing authority of the Commission to December 31, 1929. It also continued, until January 1, 1931, the time during which broadcasting licenses could not be issued for a period of more than three months or other licenses for more than one year.

For the second time all the Commissioners were legislated out of office at the expiration of practically another year, namely, February 23, 1930.[61]

The act recognized the importance of the legal problems confronting the Commission by authorizing the appointment of a General Counsel at $10,000 a year and of not to exceed three assistants to the General Counsel at $7500 a year.

By July 1, 1929, the staff of the Commission, with the exception of the Commissioners and their secretaries, had reached eighty persons, an increase of fifty-nine over the number a year earlier.

In September, 1929, the Commission ordered a reorganization of the work assigned to its members. As the Commissioners were appointed from definite zones, they had been regarded as representatives of their several zones, and all matters relating to a station had been assigned for primary investigation to the Commissioner for the zone in which the station was situated.

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[60] *Radio Service Bulletin*, December 31, 1929, p. 12.

[61] At that time all the Commissioners were reappointed. The reappointments made in February, 1929, were for the unexpired terms, but the reappointments made in February, 1930, were for terms of two to six years, as specified in the original act. Therefore, one term will expire in 1932 and one in each year thereafter until 1936. All members of the Commission in 1931 have served continuously since May, 1929.

In order to make the work of each Commissioner cover the entire field, a resolution adopted September 10, 1929, provided that the legal work, engineering activities, field investigations, and liaison with governmental and other organizations should each be in charge of one Commissioner.[62] This left the Chairman free for coördinating work.

Act of December 18, 1929. When the first regular session of the Seventy-first Congress met on December 2, 1929, the President, in his annual message, recommended that the licensing power of the Commission be made indefinite and that the appointment of Commissioners by zones be abolished. The portion of his message dealing with the Federal Radio Commission was as follows: [63]

> I recommend the reorganization of the Radio Commission into a permanent body from its present temporary status. The requirement of the present law that the commissioners shall be appointed from specified zones should be abolished and a general provision made for their equitable selection from different parts of the country. Despite the effort of the commissioners, the present method develops a public insistence that the commissioners are specially charged with supervision of radio affairs in the zone from which each is appointed. As a result there is danger that the system will degenerate from a national system into five regional agencies with varying practices, varying policies, competitive tendencies, and consequent failure to attain its utmost capacity for service to the people as a whole.

As the licensing authority of the Commission expired on December 31, prompt action was necessary if its authority was to be continued without break. By this time there appeared to have been little opposition to vesting the licensing power in the Commission, and there was passed without debate the act of December 18, 1929 (46 Stat. L., 50), placing the licensing authority in the Commission "until such time as is otherwise provided by law." This was equivalent to amending the original act to provide that the licensing should be done by the Commission, as the powers and duties of any Commission or executive officer may be terminated or changed at any time by legislation.

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[62] Federal Radio Commission, Annual Report, 1929, pp. 5–6.

[63] Cong. Record, Daily Edition, December 3, 1929, p. 26.

Congress did not adopt the recommendation of the President that the appointment of Commissioners by zones be abolished. There is no evidence regarding the attitude of the committees on this proposal, but it is likely that even if the committees had favored it, they would have hesitated to recommend it at that time, as such a recommendation is always liable to prolong debate and delay the passage of a bill.

The act of December 18, 1929, also provided for a better organization of the engineering work of the Commission by authorizing the appointment of a Chief Engineer at a salary of $10,000 a year, and two assistants to the Chief Engineer at salaries of $7500 a year.

In order to allocate broadcasting service equally among the five zones, and to give proper weight to cleared channels, power, and time of operation, the Commission, by General Order No. 92, issued June 17, 1930, formulated a system of units to be applied to each station. The text of the order, including the units assigned to each class of stations, is as follows:[64]

> Whereas, the act of Congress approved March 28, 1928, entitled "An Act continuing for one year the powers and authority of the Federal Radio Commission under the radio act of 1927, and for other purposes," provides and declares that "The people of all the zones established by section 2 of this act [radio act of 1927] are entitled to equality of radio broadcasting service, both of transmission and of reception," and
>
> Whereas, said act approved March 28, 1928, above referred to, also provides and requires that "in order to provide said equality the licensing authority shall as nearly as possible make and maintain an equal allocation of broadcasting licenses, of bands of frequency or wave-lengths, of periods of time for operation, and of station power," and
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> Whereas, it was the intent and purpose of Congress to secure an equal distribution of radio broadcasting service, both of transmission and of reception between the five zones aforesaid, and

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[64] *Radio Service Bulletin*, June 30, 1930, pp. 25–26; July 31, 1930, p. 12.

Whereas, it is necessary, in order to make and maintain such equal allocation between said five zones and fairly and equitably between the States within each of the zones, that the commission determine the value of stations of various classes or of various powers in effecting such allocations, and

Whereas, the commission has sought and obtained the best advice and information available and has given much time to an intensive study to such values of stations of various powers, and

Whereas, the commission, through its engineers and from studies made by the commission has considered all the elements required by Congress to be considered, and has allowed the paramount intent and purpose of the act of March 28, 1928, above referred to, to control; that is "that the people of all the zones . . . are entitled to equality of radio-broadcasting service, both of transmission and of reception," and

Whereas, it has been found that, according to the broadcasting service rendered to the people of each zone and of the States within each zone by stations of various classes, both of transmission and of reception, each class of station is of the following value in units, to-wit:

Classes of Stations	*Value of Units*
A. For full-time station:	
1. Stations of a power of 5 kw. or more, one station only operating on the channel at night	5
2. Stations of a power of 5 kw. or more, two stations operating simultaneously on a common frequency and separated by 2,000 miles or more	4
3. Stations of a power of 5 kw. or more, two or more stations operating on a common frequency and stations separated by less than 2,000 miles	2
4. Stations of a power 1 kw. two or more stations operating simultaneously on a common frequency	1
5. Stations with 500-watt power with more than two stations operating simultaneously on a common frequency	.6
6. Stations with 250-watt power with more than two stations operating simultaneously on a common frequency	.4
7. Stations with 100-watt power or less, with two or more stations per zone operating simultaneously on a common frequency	.2

Classes of Stations	*Value of Units*
B. Day stations:	
1. Stations of a power of 5 kw. operating during daylight hours only simultaneously with stations of class A (1), above	1.5
2. Stations of a power of 2.5 kw. operating during daylight hours only	.75
3. Stations of a power of 1 kw. operating during daylight hours only	.5
4. 500-watt, 250-watt, or 100-watt stations operating during daylight hours only, one-half values given for corresponding full-time stations above.	
C. Full-time stations having excess day power:	
All stations shall have their values in units based on one-half the units for full-time stations of same power as the stations have at night plus the value in units for a day station of the same power as the station has in daytime as follows:	
1 kw. night, 2½ kw. day equal	1.25
500 watts night, 1 kw. day equal	.8
250 watts night, 500 watts day equal	.5
100 watts night, 250 watts day equal	.3
D. Limited-time stations:	
For stations of more than 5 kw. the value of units will be the same for all powers. The units will be based on 5 units. The units for each station will therefore be 2.5 for day operation plus 2.5 times hours used between 6 p. m. and 12 p. m., local time, divided by 12.	
Stations over 5 kw. operating—	
1 night hour	2.7
2 night hours	2.9
3 night hours	3.1
For stations of 5 kw. the basis shall be 1.5 units for day operation the same as a 5 kw. day station given above, plus 2.5 units times hours used between 6 p. m. and 12 p. m. local times, divided by 12.	
Stations of 5 kw. operating—	
1 night hour	1.7
2 night hours	1.9
3 night hours	2.1
For stations operating with power of 1 kw., 500 watts, and 250 watts, the value in units shall be	

Classes of Stations	*Value of Units*
the same as for a day station plus the value in units of day station, times number of night hours used between 6 p. m. and 12 p. m. local time, dividing by 12.	
1,000-watt stations operating—	
1 night hour	.54
2 night hours	.58
3 night hours	.62
500-watt stations operating—	
1 night hour	.32
2 night hours	.35
3 night hours	.38
250-watt stations operating—	
1 night hour	.22
2 night hours	.23
3 night hours	.25

For stations dividing time on the same frequency the value assigned will be in proportion to the time assigned. It is therefore

Ordered, That the values of radio broadcasting stations of the various classes, powers, and time of operation be, and they are hereby, fixed in units as above set forth, and

It is further ordered, That each of the five zones created by section 2 of the radio act of 1927 shall each have broadcasting stations the total value in units of which shall be equal, and shall be fairly and equitably distributed among and allocated to the States within each of said zones in proportion to the population each of said States bears to the population of the zone, and that the quota of broadcasting facilities to which each State is entitled shall be determined and fixed as herein provided and in accordance with values in units for various classes of stations above set out.

Legislation and Proposed Legislation, 1930 and 1931. Changes in appellate procedure were provided by the act of July 1, 1930 (46 Stat. L., 844) which amended Section 16 of the act of 1927. Under the original act an appeal relating to a new license or a renewal or modification could be made to the Court of Appeals of the District of Columbia, but an appeal from revocation proceedings could be made either to a district court or to the Court of Appeals of the District of Columbia. The amendment of 1930 provided that all appeals should be to the Court of Appeals of the District of Columbia.

Another important feature of the act of July 1, 1930, was a provision allowing an appeal by any party adversely affected by a ruling of the Commission. Under the original act if the operation of Station A was adversely affected by a channel assigned to Station B, there could be no appeal to the courts by Station A, which might not have been a party to the original proceedings.

The Court of Appeals of the District of Columbia had interpreted the act of 1927 to authorize it to review the testimony. By the act of July 1, 1930, it was specifically provided that "the review by the Court shall be limited to questions of law and that findings of fact by the Commission, if supported by substantial evidence, shall be conclusive unless it shall clearly appear that the findings of the Commission are arbitrary or capricious". This prevented the Court from considering the case de novo, and required a ruling on the record as sent up from the Commission.

A third provision of the act of July 1, 1930, provided for a review by the Supreme Court of the United States, which had refused to review a decision of the Court of Appeals of the District of Columbia relating to radio on the ground that such a review would be essentially legislative or administrative.[65] The act of 1930 attempted to remedy this, but in the great majority of cases it is doubtful whether an appeal can be carried to the Supreme Court.[66]

The only legislation relating to radio enacted in 1931 was a bill approved February 20, 1931 (46 Stat. L., 1196), authorizing the Bureau of Standards to construct facilities and equipment for experimental researches in the propagation and reception of radio signals, and to operate an experimental radio transmitting station. The act of March 4, 1931 (46 Stat. L., 1564), appropriated $147,000 to purchase and to construct buildings and facilities. While this work will not be under the Radio Commission the results will doubtless be of value to it.

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[65] Federal Radio Commission v. General Electric Company et al., 281 U. S. 464–70.

[66] For discussion of this question see page 58.

During the Seventy-first Congress several other bills materially altering the scope of the work of the Commission passed one or both houses, but none was enacted. H. R. 11635, which passed the House on April 30, 1930, dealt originally largely with matters of procedure. This bill was amended in the Senate to provide for the transfer of the Radio Division of the Department of Commerce to the Radio Commission, to require the Commission to assign an exclusive channel for organized labor, to permit no changes in status of stations without hearing, and to effect other changes in the law. The bill passed the Senate on February 17, 1931,[67] but the amended bill was not acted upon by the House, and consequently failed of passage.

Senate Joint Resolution 176, which passed the Senate on May 22, 1930, proposed the transfer of the Radio Division of the Department of Commerce to the Federal Radio Commission. The bill was debated somewhat in the House, but no further action was taken.

Senate Bill 6, introduced in April, 1929, proposed to establish a Commission on Communications to have control over interstate transmission of intelligence by wire or wireless. As far as radio transmission is concerned the Commission on Communications would succeed to all the powers and duties of the Federal Radio Commission. The radio control now exercised by the Federal Radio Commission would be conferred directly upon the Commission on Communications, and the Federal Radio Commission would cease to exist. Extensive hearings on this bill were held by Senate Committee on Interstate Commerce in 1929 and 1930,[68] but no action was taken by either House.

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[67] Cong. Record, 71 Cong. 3d sess., Vol. 74, p. 5206.

[68] Commission on Communications—Hearings before the Senate Committee on Interstate Commerce, Seventy-first Congress, first (and second) session, on S. 6, 2392 pp., in 16 parts, 1929 and 1930.

CHAPTER II

ACTIVITIES

The activities of the Federal Radio Commission fall into two fields, (1) the licensing and regulation of domestic radio transmission, and (2) the protection of the interests of the United States in the international field.

Classes of Stations. The work of the Commission is apparent to the general public mainly in connection with the regulation of broadcasting, but other uses of wireless are of great importance and present problems of considerable magnitude. During the early days of the Commission the control of broadcasting stations received the greater part of its attention, as there was an insistent public demand that interference be reduced; as broadcasting conditions became more or less stabilized, the Commission was able to devote more time to other problems.

The major radio services have been classified by the Commission as follows:

1. Broadcasting services
2. Fixed services
3. Maritime services
4. Emergency services
5. Experimental services
6. Geophysical services
7. Alaska services
8. Aviation services
9. Amateur services
10. Governmental services.

Broadcasting Services. Broadcasting involves the transmission of speech or music on the initiative of the sending station. It is only indirectly a commercial service, as the receiving station, which is practically always a home set, pays no fee to either the government or the broadcaster. The transmitting station may derive revenue from the sale of its time to an advertiser, a political candidate, or any other person desiring to broadcast. On the other hand it may allow the use of its station free of charge to persons and organizations, or it may itself pay all expenses in connection with a program; if either of these courses is followed the station has only an indirect revenue from the good will of its listeners.

While the frequencies used in broadcasting represent little more than 4 per cent of all usable frequencies, the control of broadcasting requires probably 50 per cent of the time of the Commission.

Fixed Services. Fixed or point-to-point services are those which accept and transmit messages on a commercial basis. These services are analogous to the ordinary commercial telegraph and telephone services. In the case of radio telegraphy the licensee accepts the message from the sender, transmits it by wireless to its own receiving station, and delivers it to the addressee in the same way as a commercial company using wires. In the case of commercial radio telephony the message is ordinarily a person-to-person call. In this case the entire transaction is handled like an ordinary long-distance telephone call. The sender talks into an ordinary telephone, the licensee transmits the message by wireless, a receiving station owned by an affiliated concern picks up the wireless message, which is then routed over telephone lines to the recipient.

Maritime Services. Maritime services are in part obligatory and in part commercial. The laws of the United States and of practically all maritime nations require wireless equipment on all large ocean-going steamships, in order to promote safety of life at sea. There has developed, in addition, considerable commercial use of maritime radio or messages between agents and captains, and between passengers and persons on shore.

Emergency Services. Emergency services include police, fire boat, and power company installations. The police radio is designed to keep headquarters in immediate touch with squad and patrol cars. The issuance of licenses for police radio is governed by General Order No. 85, issued April 8, 1930,[1] specified frequencies being reserved for this purpose.

The maximum power that may be used is based on population, the several allocations being as follows:

Population	*Power (watts)*
Under 100,000	50
100,000 to 200,000	100
200,000 to 300,000	150
300,000 to 400,000	200
400,000 to 500,000	250
500,000 to 600,000	300
600,000 to 700,000	400
Over 700,000	500

Fire department service is limited to emergency communication with fire boats, and the frequency 1595 kilocycles is assigned to this service.

Power companies may use radio service for communicating with isolated units only when all other means of communication fail. The frequency assigned to this service is 3184 with a maximum power of 500 watts.

Experimental Services. Experimental services include relay broadcasting, visual broadcasting, and general experimental. Relay broadcasting involves the reception of a program on one wave-length and its retransmission on another wave-length. Frequencies are assigned only if the broadcasting is destined for foreign countries and if arrangements have been made for reception.

It is likely that as relay broadcasting develops it will be taken out of the experimental classification.

Visual broadcasting includes the transmission of such pictures as are intended to be received by the public. Picture transmission between two stations for commercial or private use comes under the classification "fixed services". Four bands, each 100 kilocycles wide; namely, 2000–2100, 2100–2200, 2750–2850, and 2850–2950 kilocycles, are set aside for visual broadcasting; in addition, the channel 2200–

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[1] Federal Radio Commission, Annual Report 1930, p. 18.

2300 kilocycles may be used if there is no interference with other radio communication.

General experimental services are those operated by qualified experimenters who conduct radio research work. Eight frequencies have been assigned to this work as follows:

1604
2398
3256
4795
6425
8650
12,850
17,300

In addition, some frequencies above 23,000 kilocycles have been assigned for limited periods for special research work.

Geophysical Services. Geophysical services are used in prospecting for mineral deposits, especially oil. These are all portable stations and are limited to five frequencies; namely, 1600, 1652, 1664, 1680, and 1704.

Alaska Services. The Alaska services are essentially the same as fixed services, but are classified separately because of the peculiar conditions. The Signal Corps of the Army operates a cable between Seattle and Alaska and furnishes radio service within Alaska. As commercial interests, particularly the canneries, are widely scattered, it is not possible for the Army radio net to reach all points. Therefore, commercial stations are licensed for short-range communications, but all long-distance transmissions must be routed through the Military Cable and Telegraph System. For commercial stations there are reserved twenty-four frequencies between 178 and 274, three between 460 and 500, seven between 1540 and 2560, and five between 3160 and 3184.

Aviation Services. Aviation services are intended mainly for the promotion of safety, and are not permitted to accept ordinary toll or commercial messages. Aviation frequencies fall into three groups, as follows:

1. Frequencies on a chain for communicating between air craft and stations or between stations, as follows: 2344, 2662, 3070, 3172, 3088, 3460, 3468, 3484, 5600, 5660, 5690, 6350, 8015 (day only), and 12,180 (day only).

2. Frequencies used for distress calling and aid to navigation as follows: 278, 333, 393, 375, 400, 414, 420, 457, 500, 3106, 5525, 11,050, and 16,580.

3. Experimental frequencies.

Amateur Stations. Amateur stations are those operated by persons interested in radio technique solely with a personal aim and without pecuniary interest. They are allowed to communicate only with other amateur stations, except in emergencies or for testing purposes. They are not allowed to broadcast entertainment of any character or to receive compensation for transmitting or receiving messages.

It is recognized that many improvements in radio technique have resulted from the work of the amateurs, and that radio experimentation offers a good field for the energies of the American boy. From the beginning of government control consideration has been given to the amateurs, and efforts have been made not to limit unduly their scope of activity. The amateur stations are more numerous than any other class. However, their licensing is largely a routine matter, and licenses are issued by the Radio Division of the Department of Commerce in the name of the Federal Radio Commission, except in the case of applications which involve controverted questions of fact.

Government Services. Government services are used as a rule entirely for messages relating to government business, the exceptions to this being that the Navy Department accepts press messages to and from foreign countries if commercial facilities are not available, and the Signal Corps of the Army handles commercial messages in Alaska. Government stations are not under the control of the Commission, as the President has power to assign frequencies for government use.

Broadcasting stations are not operated by any branch of the government. Broadcasting emanating from government offices is handled by the private broadcast stations either independently or through the regular chains. As a rule the private stations and chains are glad to handle government broadcasts without charge.

Licensing of Transmitting Stations. In the domestic field the Federal Radio Commission has only one major activity—the licensing of stations engaged in the transmission of signals, messages, or speech by means of wireless telegraph or telephone apparatus, generally known as means of radio communication.

Basis of Licensing Power. In the present stage of development of radio the number of frequencies or wave-lengths that may be used without interference is definitely limited. It therefore follows that the sovereign power must allocate the frequencies to the several stations; this power is exercised for the United States by the Federal Radio Commission, subject to certain review by the courts.

The powers exercised by the Commission are based on the fact that wireless signals can not be definitely controlled as regards distance, and as every signal is likely to extend beyond state lines, the communications are presumably interstate, and therefore subject to regulation by Congress. While the Supreme Court has never ruled on the authority of the United States to control radio transmission, the lower courts have uniformly held that such control is a proper exercise of Federal power.

As all licenses are issued subject to definite conditions, the Commission has a continuing power of suspension or revocation in case the licensee violates the provisions under which the license is granted.

Allocation of Licenses. The basic criterion, established by the law creating the Commission, is that a station license shall be granted "if public convenience, interest, or necessity will be served thereby". The act does not define public convenience, interest, or necessity, and while the Commission has been guided by this standard it likewise has not attempted to give a precise definition to the clause.

As regards broadcasting stations the Commission is definitely bound by the amendment of March 28, 1928 (44 Stat. L., 373), to make "a fair and equitable allocation of licenses, wave-lengths, time of operation, and station power to each of the States . . . according to population". The Commission comments on the method of division among States, as follows: [2]

> It is evident from a consideration of the estimated and variable factors and the different economic and geographic conditions in various parts of the United States that the quota allocation can never be exact. The ratio will vary from time to time as conditions are further improved by continued development of the radio art and decisions of the Federal Radio Commission.
>
> General Order No. 40, adopted by the commission, August 20, 1928, is an outline basis for an equitable distribution of broadcasting facilities in accordance with the Davis amendment considering public interest, convenience, and necessity. As amended, it provided for a certain number of higher power stations on interference free channels to serve rural and sparsely settled areas over long distances under favorable conditions. It also provided for a comparatively large number of smaller stations to serve State and city local areas.
>
> It is necessary for the commission to determine the maximum number of stations of various powers which could operate simultaneously at night in the United States without objectionable interference, so that quota tables could be prepared showing the facilities assigned to each zone, and each State within a zone, for comparison with facilities due.
>
> The following table was established in 1928:
>
> 40 night stations, each 5 kilowatts or more.
> 130 night stations, each 250 to 1,000 watts.
> 150 night stations, each 100 watts or less.

In accordance with this table, two or more stations dividing time on one assignment were considered as one station. ("Limited time stations" operating on clear channels and "day stations" were not charged to "quota.")

The "quota" system adopted in 1928 showed the number of full-time station assignments of each of the three classes due each State as compared to the number of full-time assignments licensed. These figures nearly all came out in fractions showing further the impossibility of an exact allocation among States based on population.

Under the 1928 system, if a State was "under quota" on one class of service and "over quota" on another class, it was not practicable to determine the total value of the three classes of asignments so that one could be balanced against another to determine if a State was actually "under or over quota" on total radio facilities.

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[2] Federal Radio Commission, Annual Report, 1930, pp. 57–58.

Therefore, the development of a "unit system" was undertaken to evaluate stations, based on type of channel, power, hours of operation, and all other considerations required by law.

The result of this research was General Order No. 92,[3] specifying the "unit value" of stations of various types, powers, etc., including "limited time" and "day" stations as chargeable to "quota."

In order to calculate the number of units due each zone and each State in accordance with population, it was necessary to determine the number of channels of different classes and number of stations of various powers which could be used for simultaneous operation without objectionable interference, and calculate the unit values, taking into account the factors of the Davis amendment. Taking these into consideration, the commission on June 25, 1930, selected 400 units as fairly representing the total broadcasting facilities of the United States. This gives 80 units to be divided among the States in each zone.

Under this plan a station of 1000 watt power, operating on a regional channel with full time is considered one unit, with the unit value of the stations of lower and higher power and varying hours of operation prorated accordingly.

On January 6, 1931, the Commission issued the following statement showing status of quotas on that date:

Status of Quotas, January 6, 1931

Zone and State	Units Due	Units Assigned	Over (+) or under (—) Quota	
			Units	Percentage
Zone 1:				
New York	35.10	38.80	+ 3.70	+ 10
Massachusetts	11.85	10.08	— 1.77	— 15
New Jersey	11.21	11.53	+ 0.32	+ 2
Maryland	4.56	4.10	— 0.46	— 12
Connecticut	4.46	3.62	— 0.84	— 19
Porto Rico	4.32	0.60	— 3.72	— 36
Maine	2.22	2.00	— 0.22	— 10
Rhode Island	1.91	1.40	— 0.51	— 27
District of Columbia	1.33	1.30	— 0.03	— 2
New Hampshire	1.31	0.20	— 1.11	— 85
Vermont	1.00	0.50	— 0.50	— 50
Delaware	0.67	0.70	+ 0.03	+ 5
Virgin Islands	0.06	....	— 0.06	—100
Total	80.00	74.83	— 5.17	— 6

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[3] For text, see page 35.

Status of Quotas, January 6, 1931—*Continued*

Zone and State	Units Due	Units Assigned	Over (+) or under (−) Quota	
			Units	Percentage
Zone 2:				
Pennsylvania	27.64	19.69	− 7.95	− 29
Ohio	19.05	18.45	− 0.60	− 3
Michigan	13.88	11.20	− 2.68	− 19
Kentucky	7.54	7.62	+ 0.08	+ 1
Virginia	6.94	9.50	− 2.56	− 37
West Virginia	4.95	3.60	+ 1.35	+ 27
Total	80.00	70.06	− 9.94	− 12
Zone 3:				
Texas	16.22	22.77	+ 6.55	+ 40
North Carolina	8.83	7.82	− 1.01	− 11
Georgia	8.09	7.60	− 0.49	− 6
Alabama	7.39	4.50	− 2.89	− 40
Tennessee	7.29	13.00	+ 5.71	+ 78
Oklahoma	6.67	7.75	+ 1.08	+ 16
Louisiana	5.83	8.50	+ 2.67	+ 46
Mississippi	5.60	2.90	− 2.70	− 48
Arkansas	5.17	4.40	− 0.77	− 15
South Carolina	4.82	1.70	− 3.12	− 65
Florida	4.09	8.35	+ 4.26	+104
Total	80.00	89.29	+ 9.29	+ 11
Zone 4:				
Illinois	22.50	32.50	+10.00	+ 44
Missouri	10.72	12.00	+ 1.28	+ 12
Indiana	9.53	6.18	− 3.35	− 35
Wisconsin	8.66	7.75	− 0.91	− 10
Minnesota	7.59	9.01	+ 1.42	+ 19
Iowa	7.30	12.62	+ 5.32	+ 73
Kansas	5.56	4.91	− 0.65	− 10
Nebraska	4.08	5.80	+ 1.72	+ 43
South Dakota	2.04	3.41	+ 1.37	+ 67
North Dakota	2.02	2.42	+ 0.40	+ 19
Total	80.00	96.60	+16.60	+ 21
Zone 5:				
California	36.85	38.53	+ 1.68	+ 4
Washington	10.16	15.92	+ 5.76	+ 57
Colorado	6.74	9.62	+ 2.88	+ 43
Oregon	6.19	8.41	+ 2.22	+ 36
Montana	3.48	3.00	− 0.48	− 14
Utah	3.27	6.60	+ 3.33	+102
Idaho	2.89	2.60	− 0.29	− 10
Arizona	2.83	2.60	− 0.23	− 8
New Mexico	2.77	2.37	− 0.40	− 14
Hawaii	2.39	1.60	− 0.79	− 33
Wyoming	1.46	0.20	− 1.26	− 86
Nevada	0.59	0.80	+ 0.21	+ 35
Alaska	0.38	1.00	+ 0.62	+163
Total	80.00	93.25	+13.25	+ 16

Control over Stations. The control exercised by the Commission over the physical aspects of all radio transmission consists of the specification of the kilocycle frequency or wave-length, of the power, and of time of operation. These features are expressly enumerated in every license except in the case of amateur stations, whose licenses give the limiting bands of frequencies which may be used.

In addition, general rules governing all stations of a particular class are binding upon all stations. Most of these rules pertain to broadcasting stations, the outstanding ones being that all broadcasting stations must cease operation when distress signals are being transmitted and must announce the character of mechanical reproductions, such as phonograph records, etc.

The Commission is expressly denied the power to censor radio communications or to interfere with the right of free speech, but the Radio Act of 1927 particularly provides that no person shall utter "any obscene, indecent, or profane language by means of radio communication". The law does not specifically provide any penalty for the use of the prohibited language, but it does provide that a license may be revoked by the Commission for failure to observe any of the restrictions and conditions imposed by the act. Therefore the Commission may exercise control through its power to revoke or refuse to renew a license.

No license has been revoked for the use of improper language, but one instance of refusal to renew a license largely on the ground of improper language having been used was commented upon by the Court of Appeals of the District of Columbia as follows:

> . . . In considering an application for a renewal of the license, an important consideration is the past conduct of the applicant, for "by their fruits ye shall know them." Matt. VII: 20. Especially is this true in a case like the present, where the evidence clearly justifies the conclusion that the future conduct of the station will not differ from the past.
>
> * * * *
>
> Appellant contends that the attitude of the Commission amounts to a censorship of the station contrary to the provisions of sec. 29 of the Radio Act of 1927. The contention

is without merit. There has been no attempt on the part of the Commission to subject any part of appellant's broadcasting to scrutiny prior to its release. In considering the question whether the public interest, convenience, or necessity will be served by a renewal of appellants' license, the Commission has merely exercised its undoubted right to take note of appellants past conduct, which is not censorship.[4]

The reasoning in the case cited above indicates that it is likely that the Court of Appeals will uphold a refusal to renew a license because of inferior quality of programs.

The work of the Commission is not analogous to that of the Interstate Commerce Commission or of a state public utilities commission, as it has no power over rates or the service that may be given to individuals.

In the case of commercial companies furnishing radio telegraph or radio-telephone service to the general public the Commission has no power over the rates that may be charged for messages. Likewise the Commission has no authority to prescribe the rates that may be charged for the use of a broadcasting station, except when the person desiring to use the station is a candidate for public office. The law provides that "equal opportunities" shall be afforded to all candidates for public office, and that the Commission shall make rules and regulations to carry this provision into effect. It is presumed that the same rate must be charged all candidates in order that "equal opportunities" may be afforded. However, the law specifically provides that a licensee is not obligated to allow the station to be used by any candidate.

The Commission has no power relative to rates or other arrangements between stations, as in cases where several stations broadcast programs originating in another station. This is generally known as chain broadcasting. As a rule two arrangements are in effect between the parent station and the local stations. If the parent station broadcasts a program for which it receives compensation, it generally pays the local station for rebroadcasting. But if the parent station broadcasts a program on its own initiative, the local stations pay for receiving the program in order to rebroadcast it.

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[4] KFKB Broadcasting Association, Inc., v. Federal Radio Commission, Court of Appeals, February 2, 1931.

It is true that the Commission has "authority to make special regulations applicable to radio stations engaged in chain broadcasting," but this authority has never been interpreted to apply to the business relations between stations. This provision was embodied in the law in order to give the receiver an opportunity to obtain different programs from several stations instead of the same program, which would be the case if the several stations were on the same chain.

So far the Commission has enforced no regulation governing chain broadcasting. On September 8, 1928, it issued General Order No. 43,[5] which provided that between 7 p. m. and midnight no two or more stations should broadcast the same program for more than one hour unless the transmitters are more than three hundred miles apart, or the stations are operating on the same frequency, or special permission was received from the Commission. This order provided no method to determine which of several stations within three hundred miles of one another should have the right to broadcast. Presumably it was necessary for the stations to reach an agreement, and if there was simultaneous broadcasting of the same program within the prescribed area both stations would be at fault
effective date of this order was postponed by su
order and it was finally rescinded by General Order
issued on December 20, 1929.[6]

Procedure on Applications. The Radio Act of 192
vides that no license shall be issued unless a perm
the construction of the station has been granted. There
the first step is the application for ruction permit
After the station is built separate a must be made
for an operating license. The proc case of both
applications is the same, although of a new
station the work in connection with t cense is

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[5] Federal Radio Commission, Annual Report,

[6] *Ibid.*, 1930, p. 14.

largely routine, as all controversial questions are generally settled in connection with the issuance of the construction permit, the purpose of the construction permit being to prevent the erection of stations which should not be operated. For a station already in operation, application must be made for a renewal of the license or for any modification of its terms.

All applications must be made under oath, and must give detailed information required by the Commission.[7] The law requires that the application be filed with the Secretary of Commerce, but the law does not impose any duties on the Department of Commerce in connection with the application.[8] As a matter of practice the application is filed with the District Supervisor of Radio of the Department of Commerce, who adds any pertinent facts which may aid the Commission, and forwards the application to the Commission. In the case of amateur stations the Radio Supervisor of the Department of Commerce is authorized by the Commission to issue the license in its name unless there are exceptional conditions which should be ruled on by the Commission.

After the application is received by the Commission it is examined in the Office of the General Counsel to determine whether the applicant is legally entitled to a license, provided there are no technical objections.

The application then goes to the Engineering Division which reports on all technical features of the proposed station. The technical aspects that must be considered include the matter of quota in the case of broadcasting stations, the availability of the frequency proposed to be used, the possible interference with other stations, and the character of the apparatus.

Having received the reports of the General Counsel and the Engineering Division, the Commission is prepared to rule on the application. If no other parties are adversely affected and if the General Counsel and the Engineering Division report favorably on the application, the license is generally granted without further procedure. If other parties are adversely affected the application is set for hearing, which is also granted if the applicant is dissatisfied with the initial action of the Commission. Hearings are always held in revocation proceedings unless the licensee acquiesces in the action of the Commission.

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[7] For form of application, see Appendix 6.

[8] The requirement that the application be filed with the Secretary of Commerce was probably adopted because the act of 1927 provided that after one year the Secretary of Commerce should be the licensing authority and the Commission should become an appellate body.

In the early days of the Commission hearings were generally held before the entire Commission, or before one member representing the Commission. At present hearings are generally held before an examiner, who submits to the Commission the exhibits, the documentary evidence that may be filed, a transcript of the oral evidence, and a report containing recommendations. A copy of the examiner's report is mailed to each party in interest, and each party has the right to file exceptions to the examiner's report, and to request an opportunity to make oral argument before the Commission.

During the initial stages of the work of the Commission public interest in its work was probably more manifest than in the case of any regulatory activity ever undertaken by the government. Persons with decided views on prohibition, the tariff, or the regulation of railroads might grumble about the rulings, but comparatively few would take the time to write a letter. But if a broadcasting station [illegible]led to its listeners for support, the [illegible] were in[illegible] clogged with thousands of letters. [illegible]ers [illegible] with writing letters; they were will[illegible] and in one case a station "filed 170[illegible] evidence which had been obtained fro[illegible]

The intense local interest in the ca[illegible] also often enlisted the support of mem[illegible] who proceeded to bring th[illegible]uence to [illegible] mission. A large part of [illegible]f mem[illegible]

• Commission on Communic[illegible] Interstate Commerce, U. S. Se[illegible] sion, on S. 6, Pt. 3, p. 100. The [illegible] sion permit affidavits to be filed on[illegible] their employees.

must necessarily be devoted to making representations on behalf of individuals or communities in their states or districts, but probably no quasi-judicial body was ever subject to so much congressional pressure as the Federal Radio Commission. Much of this, moreover, came at a time when a majority of the Commission had not been confirmed. The extent of congressional pressure is indicated by the rather guarded remarks of the Chairman of the Commission before the Senate Committee on Interstate Commerce in the following colloquy:[10]

> THE CHAIRMAN [Senator Couzens]. Mr. Robinson, before you continue to read from that paper I should like to know a little more about the statement you made a while ago that you receive letters from Members of the House and the Senate urging the granting of licenses to certain communities. I should like to ask if those letters have any influence upon the commission?
>
> COMMISSIONER ROBINSON. Well, naturally so; yes.
>
> THE CHAIRMAN. I think that is an error.
>
> COMMISSIONER ROBINSON. Who can, and it is human nature, disregard the judgment of a United States Senator? And yet if we do give weight to such communications we go beyond the purview of this act. Suppose a Senator or a Representative is in position to make a suggestion as to a grant, and some times that arises, and we act upon his position regardless of the testimony taken on formal hearings under Section 11, which provides for a hearing upon denial of an application; suppose we yield to the influence of the Congressman and deny the application, but there is a lot of evidence in behalf of the applicant; suppose that is largely done upon that influence, that we yield and deny the application, and the applicant takes an appeal to the Court of Appeals of the District of Columbia, and it is reviewing that record, then that court does not have the element that actually caused the decision.
>
> THE CHAIRMAN. Judge Robinson, do you not think it almost as reprehensible for a Member of Congress to write to the Federal Radio Commission to do or not to do a certain thing as it would be to write to a court and ask the court to do or not to do a certain thing?
>
> COMMISSIONER ROBINSON. Very frankly, Mr. Chairman, I do.
>
> THE CHAIRMAN. Why, certainly.

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[10] *Ibid.*, Pt. 5, pp. 177–79.

COMMISSIONER ROBINSON. Having been a judge of the highest court in my State, I feel that way about it.

SENATOR DILL. But I think there is a difference between writing to the Federal Radio Commission and saying, do this or don't do that, and writing to the commission and saying, I have such and such a communication, and I happen to know the facts about the matter, and I should like to have you consider those facts.

THE CHAIRMAN. There certainly can be no objection to that, Senator Dill. But many times Members of both Houses urge upon commissions to do this or that, and we are importuned to do this or that; and that is true not only in the case of the Federal Radio Commisison, but the Interstate Commerce Commission, writing in behalf of some constituent. And I think that is reprehensible. It helps to influence the judgment of commissioners and it may do great harm.

SENATOR SMITH. Well, Mr. Chairman, I think that statement needs modification, and for the reason that I do not think a Congressman or a Senator, purely for local or selfish reasons, would disregard the public welfare. But if he knows and understands a local situation and has knowledge of the facts, and believes that the public may be served or at least not injured, he has the right to ask the Federal Radio Commission—for he is a public servant himself and is looking out for the general welfare, local as well as national; I say, it becomes his duty to notify them as to what he thinks would be the proper thing to do. That is, if he knows the facts. But, as a matter of course, if one were to just selfishly say, "I want so and so done, [illegible] less of the public interest," that would be a different [illegible] But I take it no one would do that.

THE CHAIRMAN. The Senator from South C[illegible] Smith) has more confidence in the good inte[illegible] Members of Congress than I have.

SENATOR GLENN. Then, if that be so, Mr. Cha[illegible] think it might well be forbidden by law

SENATOR SMITH. If a Member [illegible] the Congress [illegible] ing any particular situation, [illegible] make a sugges[illegible] to the Federal Radio Commissi[illegible] the commiss[illegible] should give it recognition, be[illegible] member has [illegible] responsibility that he has to me[illegible] not think tha[illegible] we have quite degenerated yet to [illegible] where we are looking merely after me, my wi[illegible] And an[illegible] my son John, we four and no more

SENATOR PITTMAN. I do not thi[illegible] of the Federal Radio Commission inter[illegible] impression that they have been or are being influenced to act against their judgment.

COMMISSIONER ROBINSON. Oh, no.

SENATOR PITTMAN. But that they would be influenced just exactly as they would be influenced by the argument of any intelligent and experienced man, such as our chairman here.

THE CHAIRMAN. In the first place, a Member of Congress is not a witness before the Federal Radio Commission, and he has not the same responsibility that the commission has; he has not heard the evidence, and has not heard the arguments on both sides of the question. He usually only has the information as brought to him by some constituent, and yet he attempts to use the power of his office to influence the Federal Radio Commission, and that even though he knows that he has not all the facts in the case, which are in the possession of the commission, of course.

SENATOR PITTMAN. Now, that is the very question we are discussing and my personal view of it is that the chairman of the committee is looking at the proposition from only one side. I think he is looking at it from the standpoint that some Representative or Senator is attempting to improperly influence the Federal Radio Commission. Of course, that is reprehensible, if it occurs, but I should doubt if it occurs very often.

THE CHAIRMAN. I do not say that a Representative or a Senator knows that he is doing these things, and I do not think that he is purposely trying to improperly exercise an influence with the Federal Radio Commission, but I think that is necessarily the result of such action.

SENATOR PITTMAN. Well, I hope the result is not that. Take, for instance, the situation as stated by Senator Smith: Judge Robinson has admitted that that State has not its full quota under the present law in the matter of broadcasting stations. And we will say that a reputable concern in his State, people that he knows personally and who are reputable financially and otherwise, and they write to him and say: Here, we have had an application before the Federal Radio Commission for a long time, and we can not get action on it, can not get a reply to our application or communications, and the State is suffering by reason of the fact that we have not a broadcasting station at a certain point. You are there on the ground, and can you find out what is the matter? In that situation what is the Senator of South Carolina to do? Must he sit silently? He is a representative from the State of South Carolina, and his constituents have appealed to him, and what would you have him to do?

SENATOR KEAN. I think every State is entitled to some broadcasting.

COMMISSIONER ROBINSON. Oh, well, in a case of that kind——

SENATOR PITTMAN (interposing). I know what I would do in such a situation: I would go down and find out what was the matter.

COMMISSIONER ROBINSON. I think it is very appropriate where a Senator or a Representative is appealed to in a case of that kind to inquire about the matter. But usually these applicants come in with letters from members of the House or the Senate, and attempt to introduce them in our hearings as evidence. As chairman I have invariably ruled that they are not admissible, the same as petitions from chambers of commerce, and all that kind of thing. On the other hand, you would not present anything of the kind to a court; you would not petition the judge of a court to give a horse to the plaintiff or the defendant. Only the other day I was obliged to rule out a letter from a Cabinet officer. That is the situation with us, because we ought to admit in the record, which may go to the Court of Appeals of the District of Columbia, only those things which can be legitimately reviewed by the Court.

Appeals. An appeal may be made to the Court of Appeals of the District of Columbia by any person adversely affected by a decision of the Commission. The provision for appeals specifies that "the review by the Court shall be limited to questions of law and that findings of fact by the Commission, if supported by substantial evidence, shall be conclusive unless it shall clearly appear that the findings of the Commission are arbitrary or capricious". Under the original act of 1927 the Court of Appeals might take additional evidence, but the amendment of July 1, 1930 (46 Stat. L., 844), provides that the court shall hear the appeal on the record before it.

Prior to the amendment of July 1, 1930, the rulings of the Court of Appeals of the District of Columbia in cases respecting the granting and renewal of station licenses appealed from the Federal Radio Commission were final and were not reviewable by the Supreme Court of the United States. The Supreme Court held that the powers of the Commission regarding "the granting and renewal of station licenses are purely administrative," and that the Court of Appeals was merely "a superior and revising agency in the same field." The Supreme Court can not "exercise or participate in the exercise of functions which are essentially legislative or administrative". On the other hand "it is recognized that the Courts of the District of Columbia are not created under the judiciary article of the Constitution but are legislative courts, and therefore that Congress may invest them with jurisdiction of appeals and proceedings such as have just been described".[11]

The amendment of July 1, 1930, specifically provides that the decisions of the Court of Appeals shall be subject to review by the Supreme Court of the United States. It remains to be seen whether this is sufficient. The mere conferring of reviewing authority does not necessarily change the character of the proceedings; if they were administrative before, they are not judicial now. The act creating a Public Utilities Commission for the District of Columbia also specifically provided for an appeal to the Supreme Court (37 Stat. L., 974), but the court held that "legislative or administrative jurisdiction, it is well settled, can not be conferred on this court either directly or by appeal".[12]

The refusal of the Supreme Court to acknowledge jurisdiction in an administrative proceeding does not mean that no action of the Commission may be carried to that tribunal. It means that the court will consider only such a proceeding as is "a case or controversy in the sense of the judiciary article" of the Constitution.

Work of Department of Commerce. Certain powers and duties as regards radio communication are vested in the Secretary of Commerce, who exercises control through the Radio Division of the Office of the Secretary. These powers include the licensing of operators, the assignment of call letters, and the inspection of transmitting apparatus. The inspection work applies particularly to the apparatus required to be installed on passenger vessels in order to promote the safety of life at sea.

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[11] Federal Radio Commission v. General Electric Company et al., 281 U. S. 464–470.

[12] Keller v. Potomac Electric Company et al., 261 U. S. 444.

As the Radio Commission has no field service it depends on the field staff of the Radio Division of the Department of Commerce to maintain a check on transmitting stations in order to prevent deviation from the prescribed frequency. The field inspectors of the Department of Commerce also investigate complaints and report their findings to the Commission.

Protection of International Rights. While formal negotiations in regard to international rights fall within the field of the Department of State, the detailed work necessary to protect the interests of the United States is done by the Radio Commission.

The International Radio Convention of 1927 provides that the International Bureau of the Telegraph Union at Berne be advised of all short wave stations intended for regular service and likely to cause interference (45 Stat. L., 2853). This notification is necessary in order to establish priority in case of interference.

An International Technical Consulting Committee was established by the International Radio Convention of 1927 (45 Stat. L., 2842), and its functions and duties were [illegible] as follows (45 Stat. L., 2881):

Article 33

International technical consulting committee on r[illegible] communication

1. The International Technical Con[illegible] Committe[illegible] Radio Communication, established by A[illegible] 7 of the Con[illegible] vention, shall be charged with the st[illegible] [illegible]nnical and allied questions which relate to int[illegible] [illegible]dio communication and which shall have been [illegible] it [illegible] the participating Administrations or [illegible] [illegible]ise. Its functions shall be limited to giving [illegible] which it will have studied. It shall trans[illegible] to the International Bureau, with a view to [illegible] municated to the Administrations and private [illegible] concerned.

2. (1) This Committee shall be formed, for each [illegible] of experts of the Administrations and authorized [illegible]

radio operating companies, who wish to participate in its work and who undertake to contribute, in equal parts, to the common expenses of the contemplated meeting. The personal expenses of the experts shall be borne by the Administration or private enterprise which has appointed them.

(2) The experts of such authorized private enterprises shall participate in the work with the right to deliberate but not to vote. When, however, a country is not represented by an Administration, the experts of the authorized private enterprise of that country shall have a right, as a whole and regardless of their number, to a single vote.

3. The Administration of The Netherlands shall be charged with organizing the first meeting of the International Technical Consulting Committee on Radio Communication and with drawing up the program of work for this meeting.

4. The Administrations which shall have been represented at a meeting of the Committee shall agree on the designation of the Administration which shall call the following meeting. Questions to be studied by the Committee shall be sent to the Administration organizing the next meeting and the Administration shall determine the date and program of the meeting.

5. In principle, the meetings of the International Technical Consulting Committee on Radio Communication shall take place every two years.

The first meeting of the International Committee was held at The Hague from September 18 to October 2, 1929, the delegation from the United States[13] consisting of Major General Charles McK. Saltzman, member of the Federal Radio Commission, Major General George S. Gibbs, Chief Signal Officer, U. S. Army, and Captain S. C. Hooper, Director of Naval Communications, U. S. Navy.

A satisfactory adjustment of radio problems with Canada has been effected entirely through informal agreements between the licensing authorities of the two countries without recourse to formal treaties or conventions. Prior to the creation of the Federal Radio Commission, an informal agreement regarding frequencies for broadcasting had been made by the Department of Commerce. This agreement was unfortunately vitiated by the action of a broadcaster in the United States who used a channel assigned to a Canadian station. Later the courts held that the Secretary of Commerce had no power to assign channels.

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[13] The report of the delegation, which is largely technical, was published by the Department of State as Conference Series No. 5, International Consulting Committee on Radio Communications, First meeting. . . . 532 pages.

After the Federal Radio Commission was created the terms of the earlier informal agreement relative to channels for broadcasting were again put into effect. Early in 1930 an informal agreement was reached regarding the use of radio for aviation purposes.[14]

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[14] Federal Radio Commission, Annual Report, 1930, p. 62.

CHAPTER III

ORGANIZATION

Office of the Commission. The Federal Radio Commission consists of five members appointed by the President by and with the advice and consent of the Senate for terms of five years. The appointments are staggered so that the term of one member expires each year. One Commissioner is appointed from each of the five zones into which the country is divided, and must be a resident of the zone for which he is appointed. Not more than three of the Commissioners may be members of the same political party. The Commission elects a chairman and a vice-chairman (44 Stat. L., 1163).

The combined effect of the staggered term, the zone limitation, and the requirement regarding party representation is to limit materially the field from which the President may appoint Commissioners. The appointment from one zone of a Commissioner with party affiliations different from his predecessor practically makes it obligatory that in the following year the appointee from another zone must be from the same party as the incumbent.

The Commission as a body is the source of all power, and all formal acts are made in its name. Testimony is taken, investigations conducted, and recommendations made by various units under authority granted by the Commission, but such units are merely adjuncts for the expeditious and systematic transaction of business.

If funds are available the organization of subordinate units and the employment of subordinate personnel are entirely within the control of the Commission, as the Radio Act of 1927 states that the "Commission may appoint a secretary, and such clerks, special counsel, experts, examiners, and other employees as it may from time to time find necessary for the proper performance of its duties and as from time to time may be appropriated for by Congress" (44 Stat. L., 1163).

The subordinate units fall into two groups—administrative and technical. The detailed administrative work is done by the Office of the Secretary and its subordinate units. The Press Section may also be regarded as an administrative unit. The technical major units are the Examiners Division, the Legal Division, and the Engineering Division. Each of the units mentioned above report directly to the Commission.

Office of the Secretary. The Secretary is the chief administrative officer of the Commission, and also discharges the duties of budget officer in connection with the preparation and submittal of all estimates of appropriation, as required by Section 214 of the Budget and Accounting Act of 1921 (42 Stat. L., 23).

The Office of the Secretary is divided into the following subordinate units:

Immediate Office of the Secretary
Office of Assistant Secretary
Minute Section
License Division.

Immediate Office of the Secretary. The Immediate Office of the Secretary exercises general supervision and control over the other units.

Office of the Assistant Secretary. The Office of the Assistant Secretary has charge of most of the detailed administrative work, being divided into the following subdivisions:

Immediate Office of the Assistant Secretary
Docket Section
Disbursing Office
Division of Mails and Files
Correspondence Section
Duplicating Section
Supply Section
Telephone Section
Subclerical Section.

The Assistant Secretary acts in place of the Secretary during his absence.

The Immediate Office of the Assistant Secretary exercises supervision over his subordinate units.

The Docket Section is in charge of the preparation of the calendar of hearings, publishes the reports of examiners, and prepares the dockets for action by the Commission. It consists of one chief and five other persons.

The Disbursing Office makes all payments on account of the Commission and maintains fiscal control records. It consists of one employee.

The opening, recording, and dispatching of the mail of the Commission are duties of the Division of Mails and Files, which also files all material except that for the technical files, which are maintained by the technical divisions. The personnel consists of a chief of division and ten other employees.

The Correspondence Section prepares replies to general inquiries which are not of a technical nature or which do not raise new questions of policy or procedure. It normally consists of a chief and two assistants.

Duplicating and the mechanical addressing of envelopes constitute the work of the Duplicating Section, which consists of a chief and three other employees.

All work in connection with supplies—their procurement, storage, and issue—is done by the Supply Section, which consists of a clerk in charge and a storekeeper.

The Telephone Section, which consists of one operator, has charge of telephone switchboard and audits all vouchers for telephone service.

Janitorial and messenger work is done by the Subclerical Section, which normally consists of a head messenger and five other employees.

Minute Section. The Minute Section prepares and has custody of all minutes of hearings of the Commission. It consists of a minute clerk in charge and two other employees.

License Division. All applications for licenses first receive administrative examination by the License Division to determine whether they are in proper form. They then go to the technical divisions which make recommendations to serve as basis for action by the Commission. After the Commission acts, either favorably or adversely, the papers are returned to the License Division, which issues the license if such action conforms to the ruling of the Commission. All records of final action on licenses are retained in the License Division.

The Division is divided into the immediate office of the head, the Broadcasting Section, the Commercial Section, and the Amateur Section. These sections deal with the classes of licenses indicated by their names. The personnel of the division consists of a head, three chiefs of sections, and normally twenty-six other employees.

Engineering Division. As many of the problems growing out of the control of radio communication involve technical and scientific questions it is necessary for the Commission to have an engineering staff to analyze and study the conditions, and to present the facts to the Commission as a basis for formal action. This work is done by the Engineering Division, which was not organized until August, 1928, although the Commission had the services of radio engineers from several government departments prior to that time. The appointment of a chief engineer and two assistants was specifically authorized by the act of December 18, 1929 (46 Stat. L., 50), although the act of 1927 had authorized the employment of necessary experts.

The Engineering Division consists of the Office of the Chief Engineer, who supervises the work of the three sections which handle the details, namely, the Broadcasting Section, the Commercial Communications Section, and the International and Interdepartmental Relations Section. The Broadcasting Section and the Commercial Communications Section have similar duties in their respective fields, broadcasting being limited to the band from 550 to 1500 kilocycles, and commercial communications being restricted to the bands between ten and 550 kilocycles and above 1500 kilocycles.

Within its field of operations each of these sections is responsible for the technical examination of all applications to insure that the frequencies, power, and time conform to the regulations and policy of the Commission. Each section presents expert testimony before the Commission when needed, prepares drafts of technical regulations, and makes studies looking to the better use of the facilities available.

The International and Interdepartmental Relations Section coördinates the work of the Commission with that of other government organizations. It also advises the Commission concerning technical engineering phases of international agreements, and plans the part to be taken by the United States in international radio conferences.

The personnel of the Engineering Division consists of a Chief Engineer, two assistant chief engineers, and twenty-three other employees.

Examiners Division. In the early days of the Commission hearings were held before the entire Commission or before one or more of the Commissioners. This method consumed so much of the time of the Commissioners that they had little time left for the consideration of cases. Accordingly the work of conducting initial hearings was delegated to an examiner, who summarizes the testimony and submits a written recommendation to the Commission. This work is done by the Examiners Division, which consists of a Chief Examiner and six other employees.

Legal Division. The regulation of radio communication as prescribed in the act of 1927 gave rise to many novel legal questions as to the power of the Commission and the rights of users or prospective users of the air. In addition the act specifically provided for an appeal to the courts from the rulings of the Commission. In the early days of the Commission, counsel was assigned from the staff of the Department of Justice, but later a Legal Division was organized, the appointment of a General Counsel and three assistants being specifically authorized by the act of May 4, 1929 (45 Stat. L., 1559). The Legal Division has charge of all the law work of the Commission, including the rendering of opinions to guide the Commission and the trial of cases in the courts. It is composed of the Office of the General Counsel, and three sections, namely, Research and Drafting Section, Hearing and Record Section, and Administrative Section.

The Research and Drafting Section represents the Commission in the courts, drafts decisions, orders, and rules, and advises the Commission on legal questions.

The Hearings and Record Section is concerned only with formal hearings before the Commission. The attorney attending advises the Commission regarding the status of the matter being heard, the rights of respondents and protestants, the admission of evidence, and such other legal questions as may arise. On behalf of the Commission he cross examines witnesses in order to develop all the facts bearing on the case.

The Administrative Section reviews all applications for radio facilities as far as their legal phases are concerned. It also investigates alleged violations of the Radio Act and the rules and regulations made under it, and makes recommendations to the Commission regarding the desirability of taking disciplinary action against offending stations.

The personnel of the Legal Division consists of the General Counsel, three assistants, and fifteen other employees.

Press Section. The decisions of the Commission, lists of applications and licenses, and other matters of interest or importance relating to the radio situation are distributed to the newspapers by the Press Section. It consists of a chief and one assistant.

APPENDIX 1

OUTLINE OF ORGANIZATION

EXPLANATORY NOTE

The purpose of the Outlines of Organization in this series of Monographs is to show in detail the organization and personnel of the several services of the national government to which they relate. They have been prepared in accordance with the plan followed by the President's Commission on Economy and Efficiency in its outlines of the organization of the United States government.[1] They differ from those outlines, however, in that whereas the Commission's report showed only organization units, the presentation herein has been carried far enough to show the personnel embraced in each organization unit.

These outlines are of value not merely as an effective means of making known the organization of the several services. If kept revised to date, they constitute exceedingly important tools of administration. They permit the directing personnel to see at a glance the organization and personnel at their disposal. They establish definitely the line of administrative authority and enable each employee to know his place in the system. They furnish the essential basis of plans for determining costs by organization division and sub-division. They afford the data for a consideration of the problem of classifying and standardizing personnel and compensation. Collectively they make it possible to determine the number and location of organization units of any particular kind, such as, laboratories, libraries, blue-print rooms, or other plants, to what services attached and where located, or to determine what services are maintaining stations at any city or point in the United States. The Institute hopes that upon the completion of the present series it will be able to prepare a complete classified statement of the technical and other facilities at the disposal of the government. The present monographs will then furnish the details regarding the organization, equipment, and work of the institution so listed and classified.

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[1] 62 Cong., H. doc. 458, 1912, 2 vols.

OUTLINE OF ORGANIZATION
FEDERAL RADIO COMMISSION
SEPTEMBER 12, 1931

Organization Units: *Classes of Employees*	*Number*	*Annual Salary Rate*
1. The Commission		
Chairman	1	$10,000
Vice-Chairman	1	10,000
Commissioner	3	10,000
Secretaries	4	2,400
	1	2,000
2. Office of the Secretary		
1. Immediate Office of the Secretary		
Secretary	1	6,500
Secretary to the Secretary	1	2,000
2. Office of Assistant Secretary		
1. Immediate Office of the Assistant Secretary		
Assistant Secretary	1	3,800
Clerk-Stenographer	1	1,860
2. Docket Section		
Chief of Section	1	2,000
Assistant Chief	1	1,980
Reports Clerk	1	1,800
Junior Clerk Typist	1	1,620
	1	1,440
Typist	1	1,260
3. Disbursing Office		
Disbursing Clerk	1	2,300
4. Division of Mail and Files		
Chief of Division	1	2,300
Assistant Chief	1	1,920
Assistant Mail, Files and Record Clerk	2	1,620
Correspondence Classifier	1	1,620
Junior Clerk	1	1,440
File Clerk	1	1,440
Junior File Clerk and Searcher	1	1,440
Incoming Mail Clerk	1	1,440
Chauffeur	1	1,440

Organization Units: *Classes of Employees*	*Number*	*Annual Salary Rate*
5. Correspondence Section		
Chief of Section	1	2,100
Assistant Chief	1	1,800
6. Duplicating Section		
Chief of Section	1	1,740
Multigraph Operator	1	1,440
Mimeograph Operator	1	1,260
Messenger	1	1,200
7. Supply Section		
Order and Supply Clerk	1	1,980
Storekeeper	1	1,260
8. Telephone Section		
Operator	1	1,320
9. Subclerical Section		
Messenger	1	1,260
	3	1,200
3. Minute Section		
Minute Clerk	1	2,200
Assistant Minute Clerk	1	1,800
Typist	1	1,260
4. License Division		
1. Office of Head of Division		
Head of Division	1	2,900
Stenographer	1	1,980
2. Broadcasting Section		
Chief of Section	1	2,000
Reviewer	1	1,800
Senior License Clerk	1	1,620
Senior Broadcasting License Clerk	1	1,620
Junior Broadcasting License Clerk	1	1,620
	1	1,440
Transfer Clerk	1	1,440
Junior Files Clerk	1	1,440
3. Commercial Section		
Chief of Section	1	2,000
Ship Reviewer	1	1,800
Reviewer	1	1,800
Frequency Clerk	1	1,620
Senior Records and Reports Clerk	1	1,620
Senior Records Clerk	1	1,620

Organization Units: *Classes of Employees*	*Number*	*Annual Salary Rate*
Senior License Clerk	1	1,800
	3	1,620
Junior License Clerk	2	1,440
4. Amateur Section		
Chief of Section	1	1,980
Reviewer	1	1,800
Junior License Clerk	1	1,680
	4	1,440
3. Examiners Division		
Chief Examiner	1	5,800
Attorney Examiner	1	4,800
	2	4,600
Stenographer	1	2,160
	2	1,680
4. Legal Division		
1. Office of General Counsel		
General Counsel	1	10,000
Secretary	1	2,000
2. Research and Drafting Section		
Assistant General Counsel	1	7,500
Attorney	1	3,800
	1	3,200
Stenographer	1	1,860
	1	1,800
	1	1,500
3. Hearings and Record Section		
Assistant General Counsel	1	7,500
Attorney	2	2,600
Stenographer	1	1,800
4. Administrative Section		
Assistant General Counsel	1	7,500
Investigator	1	4,800
Attorney	1	4,200
	1	3,800
Stenographer	1	1,920
	1	1,860
	1	1,740
	1	1,620
5. Engineering Division		
1. Office of Chief Engineer		
Chief Engineer	1	10,000
Secretary	1	2,100
Assistant Clerk Stenographer	1	1,620

Organization Units: *Classes of Employees*	*Number*	*Annual Salary Rate*
2. Broadcasting Section		
Assistant Chief Engineer	1	7,500
Engineer	1	4,800
	1	4,600
	1	4,000
	2	2,600
Assistant Engineering Aid	1	1,620
Stenographer	1	1,980
	1	1,860
	2	1,680
3. Commercial Communications Section		
Assistant Chief Engineer	1	7,500
Engineer	1	4,600
	1	3,400
	1	3,200
Draftsman	1	1,740
Stenographer	1	1,740
	1	1,680
Clerk	1	1,620
	2	1,560
4. International and Interdepartmental Relations Section		
Senior Scientist	1	4,800
Principal Translator	1	2,000
6. Press Section		
Chief of Section	1	4,600
Assistant Chief	1	1,860

APPENDIX 5

FINANCIAL STATEMENT

EXPLANATORY NOTE

Statements showing appropriations, receipts, expenditures and other financial data for a series of years constitute the most effective single means of exhibiting the growth and development of a service. Due to the fact that Congress had adopted no uniform plan of appropriation for the several services and that the latter employ no uniform plan in respect to the recording and reporting of their receipts and expenditures, it is impossible to present data of this character according to any standard scheme of presentation. In the case of some services the administrative reports contain tables showing financial conditions and operations of the service in considerable detail; in others financial data are almost wholly lacking. Careful study has in all cases been made of such data as are available, and the effort has been made to present the results in such a form as will exhibit the financial operations of the services in the most effective way that circumstances permit.

The appropriations for radio control are given in the accompanying table. All expenditures from the appropriation "Enforcement of wireless communication laws" were made by the Department of Commerce up to the fiscal year 1927. This appropriation was used for work in connection with licensing until that activity was transferred to the Federal Radio Commission in 1927; it was also used for the expenses of the Commission for portions of the fiscal years 1927 and 1928.

Several of the appropriations were made to cover expenditures during or for two or more fiscal years, and are indicated in that manner in the table. One of these was retroactive and provided for payment of liabilities incurred prior to the appropriation. For these reasons it is not practicable to show appropriations and expenditures for each fiscal year. Several times a definite portion of an appropriation for one year was reappropriated for another year or for another purpose. In all such cases the amount reappropriated has been deducted from the initial appropriation, and included in the appropriation from which the payments were made.

APPROPRIATIONS AND EXPENDITURES FOR RADIO CONTROL, FISCAL YEARS 1912 TO 1930; APPROPRIATIONS, FISCAL YEARS 1931 AND 1932

Fiscal Year	Enforcement of Wireless Communication Laws		Expenses Federal Radio Commission	
	Appropriation	Expenditure	Appropriation	Expenditure
1912..........	$7,000	$6,960.19	—	—
1913..........	37,880	37,627.75	—	—
1914..........	37,880	37,739.70	—	—
1915..........	45,000	44,964.21	—	—
1916..........	45,000	44,677.04	—	—
1917..........	45,000	42,168.32	—	—
1918..........	45,000	44,983.17	—	—
1919..........	45,000	44,138.87	—	—
1920..........	65,000	64,774.92	—	—
1921..........	60,000	57,805.17	—	—
1922..........	80,000	79,760.00	—	—
1923..........	130,000	128,797.76	—	—
1924..........	139,200	138,950.23	—	—
1925..........	205,238	205,070.06	—	—
1926..........	220,525	220,394.05	—	—
1927..........	275,000	273,838.64[a]	—	(a)
1927 to 1929...	—	—	$175,000	$174,787.38
1928..........	364,000	363,586.37[b]	52,186	46,850.71[b]
1928 and 1929..	140,000	61,071.91	18,000	16,864.09
1929..........	336,160	322,687.33	96,027	95,774.89
1930..........	435,000	433,178.96[d]	295,440[e]	295,312.28[d]
1929 and 1930[c]	50,000	47,300.43[d]	—	—
1930 and 1931[c]	30,000	21,338.63[d]	—	—
1931..........	502,840	494,803.42[d]	450,000	431,169.96[d]
1932..........	646,700	—	465,380	—

[a] $28,313.86 expended on account of Federal Radio Commission from appropriation "Wireless Communication Laws".

[b] $42,512.82 expended on account of Federal Radio Commission from appropriation "Wireless Communication Laws".

[c] For construction of monitoring station.

[d] Cash basis to June 30, 1931.

[e] Includes $25,000 transferred from Enforcement of Wireless Communication Laws.

APPENDIX 7

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Explanatory Note

The bibliographies appended to the several monographs aim to list only those works which deal directly with the services to which they relate, their history, activities, organization, methods of business, problems, etc. They are intended primarily to meet the needs of those persons who desire to make a further study of the services from an administrative standpoint. They thus do not include the titles of publications of the services themselves, except in so far as they treat of the services, their work and problems. Nor do they include books or articles dealing merely with technical features other than administrative of the work of the services. In a few cases explanatory notes have been appended where it was thought they would aid in making known the character or value of the publication to which they relate.

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